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SELECTED WATER RESOURCES ABSTRACTS

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AUGUST 1, 1980

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SELECTED WATER RESOURCES ABSTRACTS

A semimonthly publication of the
Office of Water Research and Technology
U.S. Department of the Interior

VOLUME 13, NUMBER 15
AUGUST 1, 1980

W80-04801 -- W80-05100

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most our our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographic citation and a set of identifiers or descriptors which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Office of Water Research and Technology.

To provide SWRA with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

The input from these Centers, and from the 54 Water Resources Research Institutes administered under the Water Research and Development Act of 1978, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies becomes the information base from which this journal is derived.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Office of Water Research and Technology
U.S. Department of the Interior
Washington, D.C. 20240

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01 NATURE OF WATER

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02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

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06 WATER RESOURCES PLANNING

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07 RESOURCES DATA

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08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

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10 SCIENTIFIC AND TECHNICAL INFORMATION

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

LINEARIZED SUBHYDROGRAPH ROUTING OF DIRECT RUNOFF,
Nevada Univ. System, Reno. Desert Research Inst.
V. L. Gupta, P. C. Orphan, and J. W. Bird.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182058, Price codes: A03 in paper copy, A01 in microfiche. Publication No 41060, September 1979. 27 p, 4 Fig, 3 Tab, 16 Ref. OWRT-A-090-NEV(1), 14-34-001-9030.

Descriptors: *Peak discharge, *Forecasting, *Hydrograph analysis, Methodology, Reviews, Evaluating, Computer programs, Ungaged drainage basins, Rainfall-runoff relationships, Streamflow, Flow rates, Runoff, *Linearized Subhydrograph Routing.

A pilot study was conducted involving the development and testing of a computerized methodology entitled 'Linearized Subhydrograph Routing' for the estimation and simulation of the peak rates of runoff from small drainage basins. The method can be considered a refinement over the more popularly used 'rational method.' Selected rainfall-runoff events of twelve drainage basins were utilized in testing the methodology. Several limitations were recognized. The Linearized Subhydrograph Method uses data readily available to engineers, was written as a computer program for ease of calculation, and was tested with field data. (Smith-Nev)
W80-04813

WATER STORAGE ON FOREST FOLIAGE: A GENERAL MODEL,
Oregon Univ., Eugene. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W80-04826

ON A MODEL OF A NONLINEAR FEEDBACK SYSTEM FOR RIVER FLOW PREDICTION,
University of Manchester Inst. of Science and Technology (England).
For primary bibliographic entry see Field 2E.
W80-04828

WISCONSIN, A SUMMARY OF ACTIVITIES AND PLANS OF THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, 1979.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W80-04859

USE OF THE CLIMATIC WATER BUDGET TO ESTIMATE STREAMFLOW,
Delaware Univ., Newark. Dept. of Geography.
J. R. Mather.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180896, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center, University of Delaware. Technical Research Report, July 1979. 52 p, 3 Fig, 12 Tab, 14 Ref, 5 Append. OWRT A-040-DEL(4), 14-34-0001-9008.

Descriptors: *Streamflow forecasting, *Climatology, *Water balance, *Hydrologic budget, Precipitation(Atmospheric), Runoff, Overland flow, Soil water movement.

The climatic water budget provides values of water surplus, the precipitation in excess of both the evapotranspiration needs and the needs for recharge of storage in the soil root zone. It is this surplus water which will ultimately find its way to the surface to the surface streams. This report describes the problems involved in obtaining good agreement between monthly computed and measured runoff, the problems of snow accumulation and snowmelt runoff and illustrates in a step-by-step example how to lag the monthly surplus values to simulate the slow movement of water through the soil to the water table and then to the surface stream. The report also includes all necessary tables and instructions to permit computation of direct overland runoff by means of the Soil Conservation Service method and shows how such an approach can be incorporated into the climatic water budget bookkeeping procedure.
W80-04874

2B. Precipitation

INTERVENTION ANALYSIS WITH MISSING DATA,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W80-04823

MULTIVARIATE SHORT-TERM RAINFALL PREDICTION,
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.
E. R. Johnson, and R. L. Bras.
Water Resources Research, Vol 16, No 1, p 173-185, February 1980. 13 Fig, 12 Ref. NSF ENG76-118-17.

Descriptors: *Rainfall, *Forecasting, *Model studies, Mathematical models, Storms, Storm runoff, Runoff forecasting, Weather forecasting, Rain gages, Precipitation(Atmospheric), Sewers, Urban runoff, Meteorology, Short-term forecasting.

Accurate hydrologic forecasting for basins with a short response time depends on the ability to predict quantitative rainfall rates. This study developed a stochastic model for short-term (of the order of 1 hour or less) rainfall prediction. The model simultaneously predicts rainfall rates at multiple locations and for multiple values of prediction lead. All model parameters are estimated solely from telemetered rain gage data for the event being predicted. The model includes velocity and direction of storm movement as explicit parameters. The storm arrival time at each predicted point is likewise an explicit parameter, which is estimated for each location. The mean rainfall rate is not modeled as being either homogeneous spatially or stationary (constant with time). Likewise, the variance of rainfall is nonhomogeneous and nonstationary. (Sims-ISWS)
W80-04824

THE USE OF THE CLIMATIC WATER BUDGET TO EVALUATE THE VALIDITY OF A PRECIPITATION RECORD,
Delaware Univ., Newark. Dept. of Geography.
For primary bibliographic entry see Field 7B.
W80-04877

2C. Snow, Ice, and Frost

COLUMBIA GLACIER STAKE LOCATION, MASS BALANCE, GLACIER SURFACE ALTITUDE, AND ICE RADAR DATA, 1978 MEASUREMENT YEAR,
Geological Survey, Fairbanks, AK. Water Resources Div.
L. R. Mayo, D. C. Trabant, R. March, and W. Haeberli.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO 80225, Paper copy $10.00, Microfiche $3.50. Geological Survey, open-file report 79-1168, 1979. 72 p, 4 Fig, 11 Tab, 2 Ref.

Descriptors: *Glaciers, *Measurement, *Forecasting, *Icebergs, Basic data collections, Sites movement, Altitude, Regimen, Ice, Snowpacks, Ablation, Alaska, *Columbia Glacier(Alaska), Prince William Sound, Ice kinematics.

A 1 year data-collection program on Columbia Glacier, Alaska has produced a data set consisting of near-surface ice kinematics, mass balance, and altitude change at 57 points and 34 ice radar soundings. These data presented in two tables, are part of the basic data required for glacier dynamic analysis, computer models, and predictions of the number and size of icebergs which Columbia Glacier will calve into shipping lanes of eastern Prince William Sound. A metric, sea-level coordinate system was developed for use in surveying throughout the basin. Its use is explained and monument coordinates listed. A series of seven integrated programs for calculators were used in both the field and office to reduce the surveying data. These programs are thoroughly documented and explained in the report. (Kosco-USGS)
W80-04855

KNIK GLACIER, ALASKA, MAY 1979 MONUMENT AND GLACIER SURVEY,
Geological Survey, Fairbanks, AK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W80-04863

2E. Streamflow and Runoff

LINEARIZED SUBHYDROGRAPH ROUTING OF DIRECT RUNOFF,
Nevada Univ. System, Reno. Desert Research Inst.
For primary bibliographic entry see Field 2A.
W80-04813

EXTENSION AND APPLICATION OF FEATURE PREDICTION MODEL FOR SYNTHESIS OF HYDROLOGIC RECORDS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
U. S. Panu, and T. E. Unny.
Water Resources Research, Vol 16, No 1, p 77-96, February 1980. 11 Fig, 9 Tab, 20 Ref, 2 Append.

Descriptors: *Streamflow, *Synthetic hydrology, *Model studies, *Canada, Rivers, Flow, Mathematical models, Drainage, Watersheds(Basins), Stochastic processes, Analytical techniques, Mathematics, Hydrology.

The method described in this paper for the synthesis of streamflows differed from the traditional approaches in synthetic hydrology in the sense that it utilizes the information contained in or among the groups of data in a streamflow record. The existence of such groups in geophysical records, including hydrologic records, was well emphasized by Hurst. Further, in the proposed method, based on concepts of pattern recognition, neither a basic structure nor any preconceived model was imposed on the data; rather the data are allowed to speak for themselves in a most 'democratic' way. The preliminary details of the method were provided in an earlier paper by Panu and others. The intent of this paper was to describe a procedure whereby it is possible to specify explicitly multivariate probability distribution for the intrapattern structure and first-order Markovian dependence for the interpattern structure in the feature prediction model. The various steps involved in the construction and operation of the model for streamflow synthesis were presented. The application of the model for synthesizing monthly streamflow records of three Canadian rivers exhibiting biannual cycles was explained. Statistical and hydrological tests showed that these synthetic realizations possess relevant properties that are comparable with the corresponding properties contained in the historical record. This article should be read in conjunction with the previous publication by Panu and others. (See also W78-09201) (Sims-ISWS)
W80-04816

THE EFFECT OF DAM CLOSURE ON DOWNSTREAM RAPIDS,
Arizona State Univ., Tempe. Dept. of Geography.
W. L. Graf.
Water Resources Research, Vol 16, No 1, p 129-136, February 1980. 9 Fig, 35 Ref.

Descriptors: *Dams, *Streamflow, *Geomorphology, *Boulders, Rivers, Regulated flow, River regulation, Loads(Forces), Floods, Flood peak,

Erosion, Sediments, Sediment transport, Model studies, Mathematical models, On-site investigations, Hydrology, *Rapids, River rapids, Dam effects.

The force of flowing water and the resistance of the largest boulder provide a means of evaluation of the stability of rapids in canyon rivers. Field measurements and calculations showed that the closure of Flaming Gorge Dam, Utah, has had a significant effect on the stability of rapids in the canyons of the Green River in Dinosaur National Monument 68 km (42 mi) downstream from the dam. The reduction in peak flows by the dam has limited the competence of the river to move boulders deposited in the main channel by tributary processes, landslides, and prehistoric floods. Before the dam was closed, 62% of the rapids were stable, as indicated by the immobility of the largest boulder in each rapid. After the dam was closed, 93% of the rapids were stable as geomorphic/hydraulic features, though small boulders continue to move. A continuing buildup of boulders in the rapids will result from tributary contributions which are not affected by the dam. (Sims-ISWS)
W80-04820

INTERVENTION ANALYSIS WITH MISSING DATA,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W80-04823

ON A MODEL OF A NONLINEAR FEEDBACK SYSTEM FOR RIVER FLOW PREDICTION,
University of Manchester Inst. of Science and Technology (England).
T. Ozaki.
Water Resources Research, Vol 16, No 1, p 225-231, February 1980. 13 Fig, 1 Tab, 15 Ref.

Descriptors: *River flow, *Forecasting, *Model studies, Mathematical models, Rainfall, Runoff, Streamflow, Discharge(Water), Rivers, Time series analysis, Rainfall-runoff relationships, Hydrology.

A nonlinear system with feedback was proposed as a dynamic model for the hydrological system, whose input is the rainfall and whose output is the discharge of river flow. Parameters and orders of the model were estimated using Akaike's information criterion. Its application to the prediction of daily discharges of Kanna River and Bird Creek was discussed. (Sims-ISWS)
W80-04828

DEVELOPMENT OF A SELF-SEALING SAMPLER FOR EPHEMERAL WADI FLOODS,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Desert Research.
For primary bibliographic entry see Field 7B.
W80-04830

NEW ROUTING MODEL FOR CONTINUOUS RUNOFF SIMULATION,
New South Wales Univ., Kensington (Australia).
M. S. K. Chowdhury, and F. C. Bell.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 106, No HY4, Proceedings Paper 15357, p 489-500, April 1980. 6 Fig, 12 Ref, 2 Append.

Descriptors: *Channel flow, *Flood routing, *Runoff forecasting, Flood flow, Flood forecasting, Overland flow, Storage, Waves(Water), Runoff, Mathematical models, Flow, Model studies, *Runoff simulation, Continuous runoff models, Kinematics.

A new runoff routing model has been developed that combines realistic allowances for the spatial distribution of storage with the theoretically satisfying features of the kinematic wave approximation. Appropriate boundary conditions enable replacement of the partial differential equations describing the flow by tractable total differential equations. Also, similar forms of equations have been adopted to describe both overland and channel flow. All these features result in a relatively simple model with a small number of physically relevant parameters that are not difficult to evaluate. The use of the current discharge as a state variable enables the model to be automatically tuned to the current conditions and is particularly suitable for short-term flood forecasting. (Lee-ISWS)
W80-04831

FINITE ELEMENT METHOD FOR DIRECT RUNOFF FLOW,
Chuo Univ., Tokyo (Japan). Dept. of Civil Engineering.
M. Kawahara, and T. Yokoyama.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 106, No HY4, Proceedings Paper 15341, p 519-534, April 1980. 14 Fig, 15 Ref, 2 Append.

Descriptors: *Storm runoff, *Runoff forecasting, *Finite element analysis, Theoretical analysis, Floods, Flow resistance, Hydrology, Numerical analysis, Rainfall, Runoff, Hydrodynamics, Flow, Viscosity, Friction.

The Galerkin finite element method based on the linear interpolation function and explicit numerical integration scheme in time was used. Three numerical examples were illustrated. The first example was the validation of the present method. The numerical results have compared with the experimental data and the analytical solution. Both results are well in agreement. The second example discussed the selection of the refinement of the finite element mesh and the time increment. Useful suggestions were presented for the selection of the time increment. The third example showed the computation of the direct-runoff flow over Ina basin of Tenryu River. The bed resistance was seen to have significant effects both on the flow pattern and on the computational stability. The finite element method presented in this paper was shown to be adaptable for the prediction analysis of flow change due to structures. (Lee-ISWS)
W80-04832

EXPERIMENTAL DETERMINATION OF THE VELOCITY GRADIENT IN TWO DIMENSIONAL TURBULENT FLOW,
Vanderbilt Univ., Nashville, TN.
For primary bibliographic entry see Field 8B.
W80-04836

A NON-GAUSSIAN MARKOVIAN MODEL TO SIMULATE HYDROLOGIC PROCESSES,
Technical Univ. of Lisbon (Portugal). Centre for Urban and Regional Systems.
L. Valadares Tavares.
Journal of Hydrology, Vol 46, No 3/4, p 281-287, April 1980. 5 Fig, 3 Ref.

Descriptors: *Runoff, *Model studies, *Synthetic hydrology, Mathematical models, Markov processes, Mathematics, Mathematical studies, Time series analysis, Analytical techniques, Hydrology.

A Markovian process (X sub t; t = 0,1,2...) following a negative exponential distribution and with an exponentially decaying autocorrelation function was proposed and described in this paper. This model can be useful to simulate autocorrelated and skewed hydrologic variables. To show this, a successful application to model direct runoff peaks was presented. Some interesting theoretical properties of this process concerning upcrossing intervals and the distributions of extremes were also analyzed. (Sims-ISWS)
W80-04844

CHEMICAL AND SEDIMENT MASS TRANSFER IN THE GODAVARI RIVER BASIN IN INDIA,
Jawaharlal Nehru Univ. New Delhi (India). School of Environmental Sciences.
For primary bibliographic entry see Field 2J.
W80-04845

PYRANINE USED AS A FLUORESCENT TRACER IN HYDROLOGY: PH EFFECTS IN DETERMINATION OF ITS CONCENTRATION,
CEA Centre d'Etudes Nucleaires de Grenoble (France).
For primary bibliographic entry see Field 7B.
W80-04846

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 2A-1. SOUTH FLORIDA SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W80-04847

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1978 WATER YEAR,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7A.
W80-04851

USE OF THE CLIMATIC WATER BUDGET TO ESTIMATE STREAMFLOW,
Delaware Univ., Newark. Dept. of Geography.
For primary bibliographic entry see Field 2A.
W80-04874

2F. Groundwater

AN ANALYSIS OF HYDRODISPERSIVE TRANSFER IN AQUIFERS,
Bureau de Recherches Geologiques et Minieres, Orleans (France). Service Geologique National.
J-P. Sauty.
Water Resources Research, Vol 16, No 1, p 145-158, February 1980. 19 Fig, 1 Tab, 17 Ref.

Descriptors: *Dispersion, *Aquifers, *Mathematical models, Mass transfer, Porous media, Convection, Uniform flow, Curves, Equations, Tracers, Solutes, Groundwater movement, Radial flow, Transport.

This work was concerned with the nonreactive transport of solute materials in groundwater, or hydrodispersive transfer. Several types of flow fields were considered: linear (or uniform) flow with one- and two-dimensional dispersion and radial flow under diverging and converging conditions. The analysis included the two main possibilities for introduction of solutes into an aquifer: continuous and instantaneous (or slug) injection. Different solutions from the literature plus some original solutions for dispersion in a linear flow field have been unified by transposing the solutions into dimensionless variables of concentration (C sub R), time (t sub R), and the Peclet number (P). This permits an analysis of the errors committed in some commonly used approximations for dispersion as a function of P. In the case of radial flow, a numerical method using finite differences has been developed that can be applied to either diverging or converging flow problems. Results in dimensionless form when compared to the only analytical approximations that could be found (for continuous injection in a diverging flow field) indicate that the approximate solutions are in error when P is less than or equal to 10. The radial flow results are also compared to those for linear flow fields to demonstrate that in most cases either approach can be used as long as P is greater than 3. A series of dimensionless type curves has been developed showing C sub R vs. t sub R for practical ranges of P. A simple method of interpreting tracer tests was proposed using these type curves. One is able to directly determine dispersivity and kinematic porosity using curve matching techniques. Results from some recent field tests in France were analyzed using this approach. There is definite confirmation from these investigations that the apparent (macroscopic) dispersivity can vary depending on the distances used in the field. (Visocky-ISWS)
W80-04822

ORGANIC SOLUTE-MINERAL SURFACE INTERACTIONS: A NEW METHOD FOR THE DETERMINATION OF GROUNDWATER VELOCITIES,
Indiana Univ. at Bloomington.
For primary bibliographic entry see Field 7B.
W80-04827

THE ROTATION OF A VERTICAL INTERFACE IN A POROUS MEDIUM,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
A. Verruijt.
Water Resources Research, Vol 16, No 1, p 239-240, February 1980. 2 Fig, 6 Ref.

Descriptors: *Interfaces, *Density, *Porous media, *Model studies, Injection wells, Mathematical models, Groundwater movement, Soil water, Porosity, Hydraulic conductivity, Aquifers, Flow, Viscosity, Permeability, Groundwater, Density interfaces, Interface rotation.

A solution was given to the problem of the simultaneous flow of two different fluids in a vertical plane, separated from each other by a vertical interface. It was shown that the viscosities of the two fluids influence the motion of the interface only through their average value. A simple formula for the rotation of the interface was derived in terms of the relative density difference. (Sims-ISWS)
W80-04829

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 2B. SOUTH FLORIDA GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W80-04849

GENERALIZED THICKNESS OF THE SURFICIAL DEPOSITS ABOVE THE CONFINING BED OVERLYING THE FLORIDAN AQUIFER, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT,
Geological Survey, Tallahassee, FL. Water Resources Div.
R. M. Wolansky, R. K. Spechler, and A. Buono.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO 80225, Paper copy $1.75, Microfiche $.50. Geological Survey open-file report 79-1071 (WRI), 1979. 1 Sheet, 19 Ref.

Descriptors: *Geohydrologic units, *Aquicludes, *Aquifers, *Aquifer characteristics, *Florida, Groundwater, Maps, Water yield, Shallow wells, Water table, *Floridan aquifer, Southwest Florida Water Management District.

This map report presents the thickness of the surficial deposits overlying the upper confining bed of the Floridan aquifer in the Southwest Florida Water Management District. The surficial deposits range in thickness from less than 25 feet in the western part of the district to greater than 250 feet in the eastern part. The surficial deposits include sand, clayey sand, shell, and shelly marl that occur in the Holocene sand, Pleistocene marine terrace sand, and unconsolidated parts of the Fort Thompson Formation, Caloosahatchee Marl, Alachua Formation, and Bone Valley Formation. Lithologic logs and information from quarries were used in conjunction with an unpublished map prepared during an earlier investigation to compile this map at 1:250,000 scale. (Kosco-USGS)
W80-04864

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING WELL DENSITY IN THE GROUND-WATER SUBUNITS AND AREAS,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W80-04865

GROUND WATER FLOW COMPUTATIONS BY METHOD OF LINES,
Florida Univ., Gainesville. Hydrology Lab.
For primary bibliographic entry see Field 7C.
W80-04950

MEASUREMENT, PREDICTION, AND HAZARD EVALUATION OF EARTH FISSURES AND SUBSIDENCE, SOUTH-CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. K. Boling, M. Carpenter, N. Johnson, and S. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-183908, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Center, University of Arizona Project Completion Report, 1980, 96 p. OWRT A-092-ARIZ(1), 14-34-0001-9003.

Descriptors: *Erosion, *Subsidence, *Fissures(Geologic), *Pumping, *Withdrawal, Groundwater, Ephemeral streams, Sediment transport, Deposition(Sediments), Fissure closures, Arizona, *Earth fissures.

Earth fissuring and subsidence research in south-central Arizona consisted of two areas of study: (1) measurement of horizontal movements of earth fissures and (2) mapping of erosional features and hazard evaluation of earth fissures. Our records will form the data base for predictive models of subsidence and earth fissuring. Detailed bimonthly horizontal strain measurements of fissures were made over a three-year period at locations near Signal Peak, Picacho Mountains, and in Avra Valley. Fissures opened and closed repeatedly. They exhibited relatively smooth movement with occasional sudden jumps. During a major event in a locality, all fissures were affected. Some opened, and some closed. Fissures closed during long dry periods and opened after high rainfall. After periods of high pumping rates followed by high rainfall, fissures opened. Among different fissure movements the greatest total was 20.27 mm, the greatest single movement was 30 mm, and, exclusive of that, the greatest net movement was 10.9 mm. Erosional features of earth fissures were mapped and studied over a period of two years at several sites. Documentation of erosional rates and ephemeral-stream processes required the development of original instrumentation. Determination of the approximate volume of sediment and water absorbed by fissure cavities has indicated that fissure depths may commonly exceed 100 m. The relative magnitude of fissure versus subsidence-induced erosion is discussed as to the potential for ground-water contamination by way of fissures.
W80-05006

2G. Water In Soils

INFILTRATION UNDER RAPIDLY VARYING SURFACE WATER DEPTHS,
Stanford Univ., CA. Dept. of Geology.
J. W. Reeder, D. L. Freyberg, J. B. Franzini, and I. Remson.
Water Resources Research, Vol 16, No 1, p 97-104, February 1980. 8 Fig, 18 Ref. NSF ENG76-01271.

Descriptors: *Infiltration, *Soil water, *Model studies, *Laboratory tests, Mathematical models, Soil moisture, Wetting, Soil water movement, Depth, Hydrographs, Infiltration rates, Surface waters, Hydraulic conductivity, Water depths.

Effects of fluctuations in surface water depth on infiltration rates into initially unsaturated soils were investigated by numerically solving the Richards equation. The numerical model was verified through comparison with published solutions of Philip and with the results of laboratory experiments on a well-graded crushed dune sand. It was found that infiltration rates may increase with time in response to rapid rates of increase in water depth. Conditions under which this will occur were identified. (Sims-ISWS)
W80-04817

TRAVELING WAVE SOLUTIONS OF SATURATED-UNSATURATED FLOW THROUGH POROUS MEDIA,
Cold Regions Research and Engineering Lab., Hanover, NH.
Y. Nakano.
Water Resources Research, Vol 16, No 1, p 117-122, February 1980. 9 Ref.

Descriptors: *Soil water, *Soil water movement, *Porous media, *Model studies, Mathematical models, Flow, Saturated flow, Unsaturated flow, Hydraulic conductivity, Infiltration, Darcys law, Gravity, Traveling wave solution.

Traveling wave solutions to the problem of saturated-unsaturated flow of water through a uniform porous medium were derived, and the regularity properties of the solutions were studied. It was found that a singularity occurs in the higher-order derivatives of flux with respect to the space coordinate in the solutions at water tables and that the water tables can be generally interpreted as propagating acceleration waves of the nth order, where n is a positive integer. (Sims-ISWS)
W80-04819

PERCOLATION THEORY AND MODELS OF UNSATURATED POROUS MEDIA,
National Inst. for Physical Planning and Construction Research, Dublin (Ireland).
J. M. Golden.
Water Resources Research, Vol 16, No 1, p 201-209, February 1980. 1 Fig, 37 Ref, 1 Append.

Descriptors: *Percolation, *Porous media, *Theoretical analysis, *Model studies, Mathematical models, Soil water, Soil water movement, Infiltration, Pores, Porosity, Hysteresis, Wetting, Drying, Statistics, Probability.

Concepts from percolation theory were applied to a model of unsaturated flow through porous media. This approach in principle allows one to build into the model aspects of the topological structure of pore space. At a very general level the input of results from percolation theory gives a relationship between minimum and maximum saturation values for a medium which should be experimentally checkable, though probably not without sophisticated techniques. Also, it gives some qualitative insight into known properties of unsaturated flow. Furthermore, there emerges a way of looking at the phenomenon of hysteresis that is quite different from the standard approach. This aspect was explored in some detail, and two possible new models were presented. A subsidiary result obtained from the detailed model used is that in a simple pore model the inclusion of a pore length parameter, statistically correlated with pore radius, is equivalent, at least in a restricted sense, to incorporating into the model the concept of tortuosity. (Sims-ISWS)
W80-04825

2H. Lakes

WINTER LIMNOLOGICAL CONDITIONS IN A PRAIRIE POTHOLE LAKE AND THE APPLICATION OF MOLECULAR OXYGEN,
South Dakota Cooperative Fishery Research Unit, Brookings.
R. A. Fike.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180805, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, April 1979. Applegate, R. L., principal investigator. 70 p, 14 Fig, 5 Tab, 32 Ref. OWRT A-059-SDAK(1), 14-34-0001-7088.

Descriptors: *Oxygenation, *Limnology, *Winterkilling, *Iced lakes, South Dakota, Eutrophication, Lake stages, Phytoplankton, Biochemical oxygen demand, Metabolism, Hydrogen sulfide, Ice cover, Snow cover, Light penetration, Dissolved oxygen, Chlorophyll.

The use of molecular oxygen aeration under the ice cover as a method to prevent winterkill in Round Lake, South Dakota, was evaluated during

the winter of 1977-1978. Physical, chemical and biological limnological conditions are documented for the period. Round Lake and other shallow eutrophic pothole lakes in South Dakota often suffer winterkill due to their high level of nutrients that promote rapid phytoplankton growth in summer. These phytoplankton die and decay rapidly consuming dissolved oxygen by catabolic processes in winter when the ice and snow cover prevents them from getting light. During the winter studied, the ice and snow cover was formed by December 20 and after that date phytoplankton numbers and chlorophyll concentration decreased. After January 19 dissolved oxygen declined to anoxic conditions and hydrogen sulfide gas levels peaked on February 12. Measurement of the community respiration by the diel oxygen method showed that it declined to a low on January 11 and 12 while water biochemical oxygen demand increased. A molecular oxygenation apparatus was used with three different strategies to release 711,400 liters of oxygen under the ice cover. While this oxygenation did have an effect on reversing the chemical and biological interactions leading to the lake's anoxic conditions, it was not successful in preventing winterkill. Calculations of total lake oxygen demand for the winter studied (which was severe) showed a demand of 1.05 x 10 to the 8th power liters of oxygen which would require an expenditure of $70,000 to $350,000 to prevent winterkill. (Seigler-IPA)
W80-04812

SOME LIMITATIONS OF WATER QUALITY MODELS FOR LARGE LAKES: A CASE STUDY OF LAKE ONTARIO,
National Water Research Inst., Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W80-04818

VERTICAL MIXING INDUCED BY WIND AND A ROTATING SCREEN IN A STRATIFIED FLUID IN A CHANNEL,
Technion--Israel Inst. of Tech., Haifa.
E. Kit, E. Berent, and M. Vajda.
Journal of Hydraulic Research, Vol 18, No 1, p 35-58, 1980. 16 Fig, 27 Ref.

Descriptors: *Mixing, *Laboratory tests, *Entrainment, *Bodies of water, *Hydraulic models, Open channels, Flow characteristics, Stratification, Winds, Boundary processes, Circulation, Stratified flow, Saline water-freshwater interfaces, Interfaces, Water circulation, Shear stress, Analytical techniques, Methodology, Analysis, Theoretical analysis, Distribution patterns, Flow profiles, Mathematical models, Velocity, Profiles, Vertical mixing, Moving screens, Entrainment rate, Two layer fluid.

An experimental investigation of vertical mixing induced by wind or by a screen which moved horizontally over the water surface was carried out in a wind-wave channel. It was found that in the wind-wave channel the entrainment rate due to the shear stress which was exerted on the water surface by the moving screen was two orders of magnitude smaller than the one obtained in similar experiments which were carried out in an annular tank. The entrainment rate in the wind-induced mixing experiments was one order of magnitude larger than that found in the experiments with the horizontally moving screen, both carried out in the same channel. The explanation of these differences is based on the analysis of the flow patterns in the mixed layer in both systems. Results of the current experiments with the wind-induced entrainment seem to be applicable to water bodies of limited size, such as solar ponds. Since the influence of internal seiches was not the subject of the current research, the main results of this work could be used only for the estimation of the lower limit of the entrainment rate in the real bodies. (Humphreys-ISWS)
W80-04837

TECHNIQUES FOR EXPLORING AND PRESENTING DATA APPLIED TO LAKE PHOSPHORUS CONCENTRATION,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 7C.
W80-04843

WIND-DRIVEN CIRCULATION IN SMALL SHALLOW LAKES: LABORATORY AND COMPUTATIONAL EXPERIMENTS,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
A. Giorgini, and D. D. Gray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180789, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No 128, April 1980. 103 p, 44 Fig, 3 Tab, 28 Ref, 1 Append. OWRT A-048-IND(2).

Descriptors: *Lakes, *Winds, *Ponds, *Lake sediments, *Circulation, *Fourier analysis, Air circulation, Bathymetry, Sediments, Bottom sediments, Sediment-water interface, Bodies of water, Wind pressure, Effects, Water circulation, Model studies, Laboratory tests.

The research deals mainly with laboratory experiments and computational experiments. The laboratory experiments present the circulation patterns caused by different winds in two lake models built in the wind tunnel: a paraboloidal lake and a reduction of the Blackbird Pond, near West Lafayette. The experiments were executed in order to have controlled standards of comparison with the numerical experiments. The computational part of the research has been performed by using the Fast Fourier Transform algorithm technique. This was considered necessary because of the high sensitivity of sediments patterns to small velocity errors. A detailed theoretical background for the simulation is presented and several numerical experiments are performed: on the paraboloidal lake, on the Blackbird Pond bathymetry, and on a special bathymetry for which an exact solution has been found. The comparison of the laboratory experiments with the numerical experiments shows agreement, but some local deviation. This is attributed to the spatial variation of eddy viscosity in the laboratory experiment, not matched by the constant value in the numerical experiments.
W80-04870

THE ACID-BASE BALANCE IN LAKE WATER,
Swedish Water and Air Pollution Research Lab., Goteborg.
C. Brosset.
Technical Report B 540, February 1980, 21 p, 3 Fig, 5 Tab, 4 Ref.

Descriptors: *Lakes, *Acid-base equilibrium, *Methodology, *Volumetric analysis, Hydrogen ion concentration, Acidity, Alkalinity, Fulvic acid, Analytical techniques, Carbonic acid, Carbon dioxide, Weak acids, Acidity constants, Equations.

Previous studies of the determination of the concentration and acidity constants of acids in natural waters are extended to emphasize the determination of the total acid-base balance in nine lake water samples taken in January-February 1978. Using a simple titration method, the acid-base system may be divided into three parts; (1) strong acid or base, (2) weak acids, primarily fulvic acid, and (3) carbonic acid. At least two different weak acids can be determined if their acidity constants are within 0.001-0.000001 and if no other weak acids are present. All samples contained essentially the same acid with an acidity constant near 0.00002-0.00003. Two samples contained an additional acid with the constant 0.0003-0.0004. This weak acid determination makes the determination of strong base/acid concentrations in the sample possible, and subsequently, carbonic acid concentration can be calculated by using the pH value. It is concluded that excess strong base observed is generally in good agreement with previously measured alkalinity. In the cases where zero alkalinity values were reported, excess strong acid could be measured. When excess base is present, high values of H2C02 indicates the possibility of supersaturation with C02. Interestingly, this increase in supersaturation increased with concentration of the strong base and in most cases of the fulvic acid at about the same pH. No simple explanation is offered for these observations, nor is it clear why excess C02 is not easily removed, even from acidified lake water samples when they contain fulvic acid. (Luedtke-Wisconsin)
W80-05016

FRESHWATER PHYTOPLANKTON FROM THE NARSSAQ AREA, SOUTH GREENLAND,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
G. Nygaard.
Botanisk Tidsskrift, Vol 73, No 3-4, p 191-238, 1978. 378 Fig, 19 Tab, 141 Ref.

Descriptors: *Greenland, *Phytoplankton, *Lakes, *Surveys, Narssaq(Greenland), Algae, Chlorophyta, Chrysophyta, Diatoms, Density, Diversity, Oligotrophy, Population, Productivity, Sampling, Dinobryon, Freshwater.

Phytoplankton of 17 lakes situated in the Narssaq Area of South Greenland was studied as part of a detailed geo-chemical and ecological investigation. Chrysophyceae, especially a large variety of Dinobryon species make up the greater part of the plankton in most of the lakes. Chlorophyceae, represented by the chlorococcalean genera Coenococcus and Crucigeniella and by several species of the desmid Staurodemus, were prevalent or subdominant in some of the lakes. Blue-green algae is rarely found in these lakes. Diatoms play a more important role in the plankton communities than dinoflagellates. The ultra-oligothrophic character of the lakes is revealed by the low densities varying from 24 to 70,000 algal individuals and colonies/litre of surface water. Lakes in the southern part of the Ilimaussaq intrusion were extremely low in plankton, while lakes in the adjacent area displayed far greater densities. These differences may be due to the different chemical composition and physical properties of the rocks in the respective regions. In particular, the more massive, fine-grained rocks in Region 3 are covered with a dense vegetation which provides vital organic compounds to lake waters. Though these undisturbed arctic lakes are low in phytoplankton density, an exceptional diversity of species exists. Sixteen new taxons and 82 questionable taxons were reviewed. (Luedtke-Wisconsin)
W80-05018

A CONSIDERATION OF TROPHIC DYNAMICS IN SOME TALLGRASS PRAIRIE FARM PONDS,
Kansas State Univ., Manhattan. Div. of Biology.
For primary bibliographic entry see Field 5C.
W80-05025

LAKE ECOSYSTEMS: A POLYHEDRAL DYNAMICS REPRESENTATION,
New York Univ., NY. Dept. of Computer Applications and Information Systems.
For primary bibliographic entry see Field 5C.
W80-05040

2I. Water In Plants

WATER STORAGE ON FOREST FOLIAGE: A GENERAL MODEL,
Oregon Univ., Eugene. Dept. of Biology.
W. J. Massman.
Water Resources Research, Vol 16, No 1, p 210-216, February 1980. 4 Fig, 7 Ref, 1 Append. NSF DEB78-03583.

Descriptors: *Water storage, *Forests, *Mathematical models, Interception, Forest watersheds, Foliar, Fog, Model studies, Rain, Evaporation, *Forest foliage, *General model, Dimensionless parameters, Drip rate, Water storage capacity, Model predictions, Storage process, Dynamical model.

A model for the prediction of water accumulation on forest foliage was presented. It is general enough to include linear, exponential, or logarith-

mic forms for the buildup of accumulated water and to go from any one of these three limiting forms to any other in a continuous manner by varying a single dimensionless parameter. This equation unifies into a single form many other models used to predict water accumulation on forest foliage. An exploration of the underlying assumptions relating drip rate to interception intensity showed how these other models differed from one another. Evaporation was included in the model by using another dimensionless parameter which may be useful in regions where only an approximate estimate of the evaporation rate was available. To include evaporation correctly into the model, it was necessary to define the water storage capacity first in order to interpret the model predictions. (Roberts-ISWS)
W80-04826

FORESTS AND FLOODING WITH SPECIAL REFERENCE TO THE WHITE RIVER AND OUACHITA RIVER BASINS, ARKANSAS,
Geological Survey, Lakewood, CO. Water Resources Div.
M. S. Bedinger.
Geological Survey Water-Resources Investigations 79-68 (open-file report), 1979. 27 p, 4 Fig, 3 Tab, 78 Ref.

Descriptors: *Forests, *Floods, *Arkansas, *Deciduous trees, *Geomorphology, Hydrologic cycle, Plant physiology, Ecology, Submergence, Soil moisture, Drainage effects, Soil-water-plant relationships, Flood frequency, Flood plains, Model studies, Sampling, Sites, Annual flood, Benthic flora, Regulated flow, Post-impoundment, White River basin(Ark), Ouachita River basin(Ark).

The observed response of trees to hydrologic stress and distribution of trees in relation to habitat indicate that flooding, ground-water level, soil moisture, soil factors, and drainage characteristics exert a strong influence on bottomland forest species distribution. The dominant hydrologic factor influencing the distribution of bottomland tree species is flooding. Individual tree species are distributed as a function of frequency and duration of flooding. In the lower White and Ouachita River basins, the flood plains consist of a series of terraces, progressively higher terraces having less frequent flooding and less duration of flooding, and a significantly different composition of forest tree species. The sites studied can be divided into four basic groups and several subgroups on the basis of flood characteristics. On Group I (water hickory-overcup oak) sites, flooded near annually 32 to 40 percent of the time, the dominant species are water hickory and overcup oak. On Group II (nuttall oak) sites, flooded near annually 10 to 21 percent of the time, a more varied flora exists including nuttall oak, willow oak, sweetgum, southern hackberry, and American elm. The third group (Group III or shagbark hickory-southern red oak) of sites is flooded at intervals from 2 to 12 years. This group includes southern red oak, shagbark hickory, and black gum. The presence of blackjack oak in addition to Group III species marks Group IV (not flooded in historic time). (Kosco-USGS)
W80-04854

SIMULATION OF WETLANDS FOREST VEGETATION DYNAMICS,
Geological Survey, Reston, VA. Water Resources Div.
R. L. Phipps.
Ecological Modelling, Vol 7, p 257-288, 1979. 11 Fig, 12 Tab, 24 Ref.

Descriptors: *Computer models, *Wetlands, *Forests, *Vegetation, *Flood frequency, Computer programs, Model studies, Hydrologic data, Trees, Soil-water-plant relationships, Flood control, Lumbering, Dendrochronology, Ecological distribution, Environmental effects, Wildlife management, Arkansas, *White River National Wildlife Refuge(Ark), SWAMP.

A computer program, SWAMP, was designed to simulate the effects of flood frequency and depth to water table on southern wetlands forest vegetation dynamics. By incorporating these hydrologic characteristics into the model, forest vegetation and vegetation dynamics can be simulated. The model, based on data from the White River National Wildlife Refuge near Dewitt, Arkansas, 'grows' individual trees on a 20 by 20 meter plot taking into account effects on the tree growth of flooding, depth to water table, shade tolerance, overtopping, crowding, and probability of death and reproduction. A potential application of the model is illustrated with simulations of tree fruit production following flood-control implementation and lumbering. (Kosco-USGS)
W80-04860

2J. Erosion and Sedimentation

A STOCHASTIC MODEL FOR PARTICLE SORTING AND RELATED PHENOMENA,
Geological Survey, Lakewood, CO. Water Resources Div.
B. M. Troutman.
Water Resources Research, Vol 16, No 1, p 65-76, February 1980. 11 Fig, 14 Ref.

Descriptors: *Sediments, *Sediment transport, *Particle size, *Model studies, Mathematical models, Stochastic processes, Rivers, Streams, Tributaries, Sediment sorting, Bottom sediments, Sedimentology.

A number of factors contribute to the variability in particle size distribution with position, or sorting, that is often observed in natural channels. Several of these factors are readily examined by using stochastic models of particle movement along a streambed. If particle position and particle size are treated as jointly distributed random variables, then sorting is reflected in the fact that the conditional distribution of size given position depends on the value of position. This conditional distribution is most easily derived by first postulating the form of the conditional distribution of position given size and of the marginal size distribution. Further, the effect of mixing particles from two or more distinct sources can be considered by examining the joint distribution of three random variables: size, position, and source. This is useful in predicting size distribution downstream from the point where a tributary enters a channel. Longitudinally varying transport conditions, which also contribute significantly to sorting, are conveniently modeled with a nonhomogeneous Poisson process. Here it is assumed that the particle motion consists of a sequence of steps of random length, each step followed by a rest period of random duration. It is the number of particle rest positions as a function of distance from the initial position that obeys a Poisson process, so the proposed model allows for systematic change of the step length and rest duration distributions with position downstream. (Sims-ISWS)
W80-04815

THEORETICAL APPROACH TO PREDICTION OF LOCAL SCOUR AROUND BRIDGE PIERS,
Cambridge Univ. (England). Dept. of Engineering.
C. J. Baker.
Journal of Hydraulic Research, Vol 18, No 1, p 1-12, 1980. 4 Fig, 7 Ref.

Descriptors: *Scour, *Piers, *Theoretical analysis, *Mathematical models, Analytical techniques, Erosion, River beds, Alluvial channels, Flow characteristics, Vortices, Analysis, Sediments, Movement, Sediment transport, Depth, Local scour, Bridge piers, Clear water scour.

Formulae were derived that relate the equilibrium scour depth upstream of cylindrical bridge piers caused by horseshoe vortex systems to various flow parameters. Assumptions were made concerning the vortex size and shape during the scouring process and concerning the forces on particles within the scour hole. The derived formulae were found to be in good agreement with experimental results. (Humphreys-ISWS)
W80-04835

CHEMICAL AND SEDIMENT MASS TRANSFER IN THE GODAVARI RIVER BASIN IN INDIA,
Jawaharlal Nehru Univ. New Delhi (India). School of Environmental Sciences.
G. Bikshamaiah, and V. Subramanian.
Journal of Hydrology, Vol 46, No 3/4, p 331-342, April 1980. 4 Fig, 7 Tab, 21 Ref.

Descriptors: *Mass transfer, *Chemicals, *Sediments, *Sediment transport, Rivers, Watersheds(Basins), Runoff, Rainfall, Evaporation, Monsoons, Suspended solids, Dissolved solids, Salts, Discharge(Water), Hydrology, Sedimentology, *India, *Godavari River(India).

Mass transfer in the Godavari River is predominantly monsoonal since 95% of the total annual load is transported in the wet season. The annual denudation rate varies from one part of the basin to the other, but the basin as a whole is being eroded at a rate higher than that of the world global average. This may be due to the fact that 85% of the basin is covered by intensive human activity. While geology is a controlling factor from a quality point of view, discharge and elevation control quantitatively the annual mass transfer into the Bay of Bengal. The sediment load, representing physical weathering, is about seven times that of the chemical load. Monthly and annual variations in mass transfer as a function of time and space have been observed in the river basin. The annual mass transfer of the river is about 10% of that of the Himalayan drainage system. (Sims-ISWS)
W80-04845

SEDIMENT DISCHARGE IN THE SANTA CLARA RIVER BASIN, VENTURA AND LOS ANGELES COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. P. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-162951, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 79-78, August 1979. 51 p, 20 Fig, 8 Tab, 16 Ref.

Descriptors: *Sediment discharge, *River basins, *California, *Sediment yield, *Streamflow, Sampling, Measurement, Estimating, Sediment transport, Sediment load, Particle size, Bed load, Erosion control, Beaches, Hydrologic data, *Santa Clara River basin(Calif).

Sediment data collected in the Santa Clara River in California basin, during the 1967-75 water years were analyzed to determine the particle size and quantity of sediment transported past three gaging stations. The total sediment discharge of the basin, computed from records of Santa Clara River at Montalvo for water years 1968-75, was 63.5 million tons, of which 59.5 million tons was carried in suspension and an estimated 4 million tons was transported as unsampled sediment discharge. About 17.7 million tons, or 28 percent of the total sediment discharge, was coarse sediment (particles larger than 0.062 millimeter). Most of the sediment was transported during only a few days of flood-flow each year. During the 1968-75 water years, approximately 55 percent of the total sediment was transported in 2 days and 92 percent was transported in 53 days. The long-term (1928-75) average annual sediment discharge of the Santa Clara River at Montalvo is estimated at 3.67 million tons. Of that quantity, 2.58 million tons consisted of fine sediment and 1.09 million tons consisted of coarse sediment. A sediment budget for the Santa Clara River basin was estimated for sediment discharges under both natural and actual conditions. The major difference between natural and actual sediment discharges of the Santa Clara River basin is the sediment intercepted upstream from Lake Piru. The combined trap efficiency of Lake Piru and Pyramid Lake approaches 100 percent. Sediment deposited in these reservoirs resulted in about a 6-percent reduction of sediment to the Santa Clara River basin during the historical period (1928-75) and a 12-percent reduction during the period most affected by dams (1953-75). Sediment losses to the basin by gravel mining, diversion of flows, and interception of sediment in the Castaic Creek basin

resulted in additional reductions of 2 percent during the period 1928-75 and 4 percent during the period 1953-75. (Kosco-USGS)
W80-04856

SEDIMENT TRANSPORT BY THE WHITE RIVER INTO MUD MOUNTAIN RESERVOIR, WASHINGTON, JUNE 1974-JUNE 1976,
Geological Survey, Seattle, WA. Water Resources Div.
L. M. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A075 139, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 78-133, June 1979. 26 p, 7 Fig, 2 Tab, 5 Ref.

Descriptors: *Sediment transport, *Streamflow, *Reservoirs, *Washington, *Data collections, Discharge(Water), Sampling, Bed load, Particle size, Aggradation, Suspended load, Sediment discharge, *White River(Wash), *Mud Mountain Reservoir(Wash).

This reconnaissance evaluation of the sediment transport by the White River into the Mud Mountain Reservoir, in Washington, during the period June 1974-June 1976 showed that the river transported 430,000 tons of suspended sediment into the reservoir during the first year of the study and 1,400,000 tons in the second year. Daily mean suspended-sediment concentrations generally were less than 500 milligrams per liter; the highest daily mean concentration was 6,200 milligrams per liter on December 1, 1975. A good relation exists between daily suspended-sediment discharge and daily mean water discharge except during periods of runoff from glacial melt. Data from samples obtained by the use of the Helley-Smith bedload sampler indicate that the bedload measured using the sampler is about 4 percent of the suspended-sediment discharge. Potential deposition in the reservoir was estimated at 750 acre-feet during the 2 years of study. (Kosco-USGS)
W80-04857

SIMULATION OF RESERVOIR AND LAKE SEDIMENTATION,
Kansas Water Resources Research Inst., Manhattan.
W. M. Merrill, and Y. M. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182801, Price codes: A08 in paper copy, A01 in microfiche. Project Completion Report, April 1980. 144 p, 17 Fig, 7 Tab, 30 Ref, 2 Append. OWRT B-036-KAN(1), 14-31-0001-4085.

Descriptors: *Sedimentation, *Lake sediments, *Reservoir silting, *Sediment transport, Silt, Clay, Sediment distribution, Model studies, Simulation analysis, Computer programs, Alluvial streams.

In the course of an investigation of sedimentation in reservoirs, two lakes Decatur in Central Illinois and Kanopolis in west central Kansas, have been used to develop a model of reservoir sedimentation and two computer programs to simulate it. Data from a third lake, Harry E. Strunk in southwestern Nebraska, have been gathered to be used for further testing of the programs. Basis for the model is a statement of general relationships formulated by Sloss (1962) to describe sedimentation in shallow marine basins, modified to apply to relatively small freshwater bodies (Merrill and Chang, 1973). In its modified form, the statement serves as foundation for quantitative and semiquantitative expressions that are translated into algorithms to simulate reservoir processes. The model and programs are appropriate only for reservoirs established on alluvial streams in which an essentially unlimited supply of sediment, 90 percent or more of which is silt and clay and at least 30 percent of which is clay of two microns or less, can be assured. Movement of the water-sediment mixture, deposition, erosion, compaction, and the passage of time are incorporated in the simulation. Results of the simulation compare favorably to observed configurations in the reservoirs modeled. At least one of the hypotheses proposed to explain distribution of sediment in reservoirs probably can successfully be tested with these programs.
W80-05010

2K. Chemical Processes

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 2A-2. SOUTH FLORIDA SURFACE WATER QUALITY.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W80-04848

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 2B. SOUTH FLORIDA GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W80-04849

DETERMINATION OF TRACE ELEMENTS IN NATURAL WATERS BY THE D.C. ARGON PLASMA, MULTIELEMENT ATOMIC EMISSION SPECTROMETER (DCP-MAES) TECHNIQUE,
Colorado State Univ. Fort Collins. Dept. of Chemistry.
For primary bibliographic entry see Field 7B.
W80-04858

WELL MAINTENANCE PROGRAMS CAN PREVENT FAILURES,
UOP, Inc., St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 8A.
W80-05084

2L. Estuaries

DISPERSION IN TWO-LAYER STRATIFIED WATER BODIES,
National Technical Univ., Athens (Greece). Applied Hydraulics Lab.
G. C. Christodoulou, and J. J. Connor.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 106, No HY4, Proceedings Paper 15342, p 557-573, April 1980. 9 Fig, 19 Ref, 1 Append.

Descriptors: *Stratified flow, *Dispersion, *Mathematical models, *Tidal waters, Bays, Mixing, Stratification, Water quality, Distribution patterns, Model studies, Analytical techniques, Diffusion, Theoretical analysis, Numerical analysis, Finite element analysis, Bodies of water, Estuaries, On-site investigations, *Massachusetts Bay, Two-layer model, Model verification.

A finite element model was developed for the numerical prediction of the dispersion process in a strongly stratified water body idealized as a two-layer system. The physical processes of mixing through the density interface and horizontal dispersion were discussed. Numerical integration in time is based on an implicit iterative trapezoidal scheme. Results for one-dimensional counterflow conditions were verified with analytical solutions. The model was applied to a large dispersion experiment in Massachusetts Bay. Taking into account the initial spreading of the source and the uncertainties about the velocity field, good qualitative agreement was observed with respect to the location and peak values of the plume. The development of numerical techniques is outgrowing the present ability to define realistic inputs as well as the basic knowledge of some of the physical processes involved. Further fundamental research is needed for better understanding of the turbulent mixing process in stratified environments. Also, field monitoring programs are required to provide reliable inputs, primarily on the behavior of the interface along open boundaries. (Humphreys-ISWS)
W80-04833

VERTICAL MIXING INDUCED BY WIND AND A ROTATING SCREEN IN A STRATIFIED FLUID IN A CHANNEL,
Technion--Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 2H.
W80-04837

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DEVELOPMENT OF REVERSE OSMOSIS MEMBRANE FOR SEAWATER DESALINATION,
Membrane Systems, Inc., San Diego, CA.
R. G. Sudak, J. B. Bott, R. L. Fox, S. J. Gagner, and M. E. McKee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182090, Price codes: A06 in paper copy, A01 in microfiche. Final Report to Office of Water Research and Technology, September 1979. 112 p. OWRT C-80278-S(No 8523)(1), 14-34-0001-8523.

Descriptors: *Reverse osmosis, *Membranes, *Sea water, *Desalination processes, *Membrane processes, Polyethylenimine, Isophthaloyl chloride, Polyimide membranes, Poly(Epichlorohydrin-secondary diamines).

Composite reverse osmosis membranes were formed with a polysulfone porous substrate. The membrane barrier layer was formed on this substrate by the interfacial polycondensation of polyethylenimine and isophthaloyl chloride. The barrier layer was shown to be capable of single stage seawater desalination in that selected membrane samples had a flux of 17 GFD and a rejection of 99% when operated on a feed-water containing 35,000 mg/l of sodium chloride at 800 psig and 75F . Manufacturing yields of this membrane would be expected to be low due to the poor quality of fabric carrier material which is available. Asymmetric polyimide membrane was developed further by optimization of casting formulations and conditions. When tested under seawater conditions as described above, the best results obtained were 5.8 GFD and 98.4% rejection. A composite membrane barrier layer was formed on polysulfone substrate interfacially with poly (epichlorohydrin-secondary diamines) and isophthaloyl chloride. The best results obtained with this membrane under seawater conditions were 9.6 GFD and 94% rejection.
W80-04802

3B. Water Yield Improvement

LEGAL SYSTEM REQUIREMENTS TO CONTROL AND FACILITATE WATER AUGMENTATION IN THE WESTERN UNITED STATES,
For primary bibliographic entry see Field 6E.
W80-04995

IMPROVING YIELDS OF OPEN WELLS IN CONSOLIDATED ROCKS USING EXTENSION DRILLING TECHNIQUES,
Geraghty and Miller, Inc., Annapolis, MD.
For primary bibliographic entry see Field 8A.
W80-05057

3C. Use Of Water Of Impaired Quality

APPLICATION OF CONTINUOUS HYDROLOGIC MODELING TO EVALUATE AND DESIGN WASTEWATER LAND DISPOSAL OR EVAPORATION SYSTEMS,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
J. J. Zovne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-181050,

Price codes: A04 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Kansas State University Project Completion Report, March 1980, 48 p, 11 Fig, 8 Tab, 7 Ref, 2 Append. OWRT A-090-KAN(1), 14-34-0001-8018.

Descriptors: *Hydrology, *Design, Lagoons, Evaporation, *Ponds, *Kansas, Monitoring, Water level fluctations, Soil moisture, Runoff, Percolation, *Water reuse, *Hydrologic model, *Land treatment systems, *Municipal wastewater, Wastewater disposal, *Irrigation.

The hydrologic design of land treatment systems has largely been accomplished by annual or semi-annual estimates of the disposition of the input wastewater load. The operation of these systems is, however, dependent upon daily variations in precipitation, evaporation, and land treatment/irrigation area water management. The subject of this report is a hydrologic model which has been developed to design these systems based upon a continuous simulation of the daily water budget of a storage pond and irrigation disposal area system. The user of this program would need to identify a nearby weather station having long-term daily precipitation and temperature records. He would also need to identify the soil type in the disposal area, and specify the storage pond size, the irrigation disposal rate, the crop or cover on the disposal area, and the level of available soil moisture when irrigation ceases. The model monitors the daily pond level fluctuations and overflows; soil moisture, runoff, and percolation in the disposal area; and gives monthly and annual summaries of all hydrologic variables. By manipulating sizes and rates, the user can design an optimal system. An example is given for the Kinsley, Kansas, system. The application of the model to evaluating State of Kansas nondischarging lagoon design procedures is also presented.
W80-04804

WASTEWATER RECYCLING: DEVELOPMENT OF PLANT DISEASE IN AN OLD FIELD ECOSYSTEM,
Michigan State Univ., East Lansing. Dept. of Botany.
K. Epstein, K. Ditz, and G. R. Safir.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-181043, Price codes: A03 in paper copy, A01 in microfiche. Institute of Water Research, Michigan State University, Project Completion Report, April 1980. 37 p, 9 Fig, 10 Tab, 36 Ref. OWRT A-097-MICH(1), 14-34-0001-8024.

Descriptors: *Wastewater irrigation, *Plant disease, Pathogens, Coleosporium solidaginis, Erysiphe cichoracearum, Phyllachora graminis, Helminthosporium, Sp, *Return flow, Recycling, Water pollution effects, *Filter sterilized wastewater, *Tapwater, Old field.

During 1978 and 1979, the threat of plant disease in a wastewater irrigation field dominated by goldenrod and quackgrass was assessed. Pathogens that were abundant in the wastewater irrigated areas, Coleosporium solidaginis, Erysiphe cichoracearum, Phyllachora graminis and Helminthosporium sp., alternate on economically important hosts. The increased disease in the irrigated areas seemed mainly due to moisture and disease severity was reduced by a midseason harvest. Levels of plant pathogens in the wastewater were apparently low since wounded seedlings of 12 varieties of 7 field crops soaked in wastewater remained healthy. There was no difference in the survival of Alternaria tensuis or Stemphylium sarcinaeforme after 24 days in filter sterilized wastewater or tapwater, but both Erwinia herbicola and E. atroseptica survived better after 24 hrs in wastewater than in tapwater.
W80-04805

WASTE WATER FOR CROP IRRIGATION.
Ground Water Age, Vol 14, No 7, p 23, 28, March, 1980.

Descriptors: *Irrigational practices, *Waste water disposal, Sewage disposal, Water spreading, Crop response, Municipal wastes, Ground water, Water quality, Environmental effects, Economics, Safety.

The use of municipal effluent for agricultural purposes is becoming a popular means of waste water disposal. Researchers at Texas Tech University Water Resources Center, under an EPA contract, will provide information on the long- and short-term effects of sewage on crops, soils, the quality and quantity of ground water, and the economics of the process. This information will be used to structure guidelines for cost effective, productive and environmentally safe use of sewage water for land application, and to evaluate existing EPA guidelines. (Purdin-NWWA)
W80-04842

AQUIFERS STORE ENERGY.
Geotimes, Vol 25, No 3, p 28-29, March, 1980. 1 Fig.

Descriptors: *Aquifers, *Energy storage, *Cooling water, *Heated water, Non-consumptive use, Power plants, Peaking capacity, Heat balance.

Battelle's Pacific Northwest Laboratory will test the feasibility of using aquifers to store hot or cold water for later retrieval for heating or cooling. Advantages of aquifer energy storage include: (1) more efficient use of heat from solar energy and other alternative-energy systems that vary with seasonal or weather changes; (2) waste heat from factories or electric power plants is recovered, (3) cooling towers might be eliminated for some power plants; (4) it is non-consumptive use of water; (5) non-potable ground water can be used; (6) up to 95% of the original heat can be retrieved; (7) it can be used in conjunction with coal-fired heating systems to meet high energy demands during peak periods. Two other field studies are currently underway at Auburn University and the University of Minnesota, Minneapolis. A major conclusion of Battelle's program is that aquifer energy storage is ideal for a complex of adjacent buildings or a small community. While it would not have direct application on a regional basis, it could ease the regional power supply situation by helping reduce energy needed to offset seasonal changes in power demands. (Purdin-NWWA)
W80-04940

DRILLING FOR ENERGY ALTERNATIVES.
Ground Water Age, Vol 14, No 6, p 25, 44, February, 1980.

Descriptors: *Geothermal studies, *Drilling, *Geopressured aquifers, *Louisiana, Thermal water, Methane, High pressure, Well spacing, Land subsidence, Brine disposal, Oil wells, Coastal plains, Bayous.

According to the Louisiana Department of Natural Resources, as much as forty million gallons per well per day of geopressured water at temperatures from 250-400F can be withdrawn from the coastal zone aquifers. In addition, it is estimated that over 13.6 trillion standard cubic feet of dissolved methane gas is contained in these aquifers, and downhole pressures may attain one psi per foot of depth. Test wells are expected to exceed 10,000 feet in depth and cost about $10 million each. Disadvantages of geopressure drilling and production are: (1) wells must be widely spaced; (2) land subsidence could occur; (3) brine disposal may cause pollution; and (4) oil and gas production may be reduced. (Purdin-NWWA)
W80-04949

SALTY WASTE WATER--AN IRRIGATION SOURCE..
Ground Water Age, Vol 14, No 6, p 28, 30, February, 1980.

Descriptors: *Impaired water use, *Return flow, *Irrigation water, Water reuse, Brackish water, Cotton, Land reclamation, Leaching, Drainage, Drainage water, Saline soils, Halophytes, Salt tolerance.

A four-year study near Bakersfield, California will determine the yield of cotton irrigated with saline agricultural drainage wastewater, evaluate the extent of salt buildup in the soil, and determine if the soil can be desalinated by irrigating with low-salinity water. One reason for this study is the buildup of brackish irrigation water in the San Joaquin Valley. A drainage canal will eventually take the waste waters out of the valley, but to reduce the volume of water and the size of the canal, researchers are finding ways of using the water on a succession of salt tolerant crops. Under study will be low salinity water (200 ppm), high salinity water from a brackish well (5,800 ppm), and a mixture of the two (3000 ppm). Application rates will be adjusted to the salinity level of the water. Higher salinity water will require an extra amount which leaches salt below the root zone to minimize salt damage to the plants. (Purdin-NWWA)
W80-04955

USE OF THE WATERS OF THE COLORADO RIVER IN MEXICO: PERTINENT TECHNICAL COMMENTARIES,
For primary bibliographic entry see Field 6E.
W80-04985

THE COLORADO RIVER SALINITY AGREEMENT OF 1973 AND THE MEXICALI VALLEY,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 6E.
W80-04986

A THEORETICAL ANALYSIS OF MINUTE 242,
New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 6E.
W80-04988

3D. Conservation In Domestic and Municipal Use

ANALYSIS OF THE WATER RATE STRUCTURE AS A MANAGEMENT OPTION FOR WATER CONSERVATION,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
J. W. Male, C. E. Willis, F. J. Babin, and C. J. Shillito.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182595, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Center, University of Massachusetts, Publication No 112, 1979. 89 p, 4 Fig, 5 Tab, 35 Ref, 3 Append. OWRT-A-125-MASS(1), 14-34-0001-97023.

Descriptors: *Water conservation, *Water rates, *Pricing, *Water costs, *Cost analysis, Cost allocation, Cost-benefit analysis, Marginal costs, Water consumption, Average costs, Declining average costs, Elasticity of water demand, Water management(Applied), Water meters, Meter reading routing, *Potable water.

The objective was to assess the potential for residential water conservation by altering the price structure. This document reports on the general consumer responsiveness to variations in water price structure and on an application to one case study. Consumer responsiveness was assessed by applying an ordinary least squares regression analysis to three different functional forms each containing the water price, median income, number of persons per meter, and population density as independent variables. The analyses yielded a range of price elasticities, with the exponential functional form yielding a median value of -.37. Results of the general analysis were applied to a case study to estimate the degree of consumer responsiveness to three different rate structures. Results showed an estimated reduction of residential demand of approximately 15 percent for a three month water short period. In addition to the demand estimates several practical matters were considered which would affect the implementation of water conserving rate structures. These include equity among users (including non-residential) and water meter reading and billing practices. A systematic method

for determining meter reader routes was outlined and billing practices which might aid in water conservation were suggested. (Godfrey-Mass)
W80-05007

3F. Conservation In Agriculture

MANAGEMENT OF SUMMER-SEASONAL IRRIGATION WATER IN BEEF COW/CALF AGRICULTURE IN THE SIERRA NEVADA FOOTHILLS,
California Univ., Davis. Dept. of Agronomy and Range Science.
C. A. Raguse, and W. A. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180920, Price codes: A02 in paper copy, A01 in microfiche. California Water Resources Center, University of California, Davis Technical Completion Report, March 1980, 6 p, 1 Fig, 3 Tab. (California Water Resources Center Project UCAL-WRC-W-495). OWRT-B-175-CAL(5).

Descriptors: *Range management, *Economic feasibility, *Economic efficiency, Grazing, *Linear programming, Model studies, Microenvironment, Conservation, *Irrigation water, *Irrigation efficiency, California, *Sierra Nevada foothills.

Efficient agricultural production in the Sierra Nevada foothills is generally achieved only through the use of the grazing animal. Economically this region has a comparative advantage, for the production of beef calves, over regions of intensive agriculture. Grazing is also an appropriate biological tool for land management in the nonagricultural interests of the general public. Use of seasonally available irrigation water for perennial and annual forages was evaluated in terms of biological yield and economic feasibility. These forages could be used to supplement winter- and spring- growing annual range. A linear programming model for resource allocation was developed. Emphasis was given to achieving maximum user-level flexibility in assigning values-such as land and forage classes, length of season and animal requirements-to the various assumptions of the model. Management practices which modify the soil-plant microenvironment can affect plant vegetative regeneration, dry matter production and symbiotic nitrogen fixation. The effects of various factors including light, temperature and phosphorous levels were studied in controlled environment facilities and in the field. (Snyder-Calif)
W80-04803

GROWTH OF SUBTERRANEAN CLOVER IN A RANGE SOIL AS AFFECTED BY MICROCLIMATE AND PHOSPHORUS AVAILABILITY. III. COMPARATIVE GROWTH OF SUBTERRANEAN AND ROSE CLOVERS AT COLD SOIL TEMPERATURES,
California Univ., Davis. Dept. of Agronomy and Range Science.
C. A. Raguse, and K. L. Taggard.
Agronomy Journal, Vol 71, p 523-528, July-August 1979. 4 Fig, 4 Tab. (California Water Resources Center Project UCAL-WRC-W-495). OWRT-B-175-CAL(6).

Descriptors: *Red clover, *Clovers, *Legumes, *Soil temperature, *Climates, *Growth rates, *Environmental control, Temperature, Rainfall, Ranges, Range management, Environmental effects, Nitrogen fixation, Soil-water-plant relationships, Winter, Range grasses.

The biological yield potential of winter annual range legumes is influenced by the timing of rainfall adequate to ensure germination. If rains are late, the establishment phase of growth must occur at cold soil and air temperatures. On low-P soils, this combination of abiotic factor constraints can limit symbiotic N fixation. Three controlled-environment experiments were conducted to compare the seedling growth of rose clover and subterranean clover on a P-deficient soil, simulating winter conditions of cold soils and low light. Comparative growth responses, especially intraplant dry matter partitioning and nodulation, were observed for several soil P availability levels. A sunlit phytotron provided a common shoot environment of seasonal (fall/winter) ambient light intensity and photoperiod, with a programmed smooth diurnal temperature cycle of 20C maximum and 5C minimum. Three independently-controlled water baths maintained soil temperature experiments at a constant 5C, a constant 10C, and a diurnal 5C to 10C alternation. Phosphorus levels were 0, 45, 90, and 180 kg/ha equivalents. Growth intervals (5 + or - 0.5 trifoliate-leaf stage), varied between 58 and 114 days. The results suggest that while the practical soil threshold temperature for overall growth is near 5C, some intraplant growth processes may proceed, but only at adequate availability levels of mineral nutrients. (Snyder-California)
W80-04814

CORN RESPONSE TO AMMONIACAL NITROGEN UNDER VARYING LEVELS OF MAGNESIUM AND POTASSIUM FERTILITY,
Delaware Univ., Newark. Dept. of Plant Science.
M. R. Teel, W. H. Mitchell, A. L. Morehart, and D. K. Brauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182124, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, University of Delaware Completion Report, April 1980, 32 p, 17 Tab. OWRT A-039-DEL(1), 14-34-0001-8008.

Descriptors: *Crop response, *Ammonification, *Nitrogen, *Subsoil, *Experimental forms, Lime, Corn(Field), Cover crops, Rye, Irrigation, Evaluation, Magnesium, Potassium.

Eight nitrogen treatments, varying with respect to nitrogen source (ammonium versus nitrate), and method of application, were compared with corn (Zea Mays L.) under four levels of potassium (0, 50, 100 and 200 lbs. K20/acre/yr as KCl) within each of three lime regimes (no lime, dolomitic, or calcitic lime). The research was conducted during the growing seasons of 1976 - 1979. Salient data from the 1978 and 1979 seasons are reported. A randomized split-split block design was used, replicated three times, with lime sources as main plots; potassium levels as sub plots, and nitrogen treatments as sub-sub plots. Nitrogen was applied in split applications either broadcast in granular form or injected as a solution into the water system used for subsurface irrigation (SSI). Sodium nitrate (NaN03) and urea (C0-(NH-2)2) were used as sources of nitrate (N0-3) and ammonium (NH+4) nitrogen respectively. Urea was injected both with and without Nitrapyrin, (2-choro-6-(trimethyl)-pyridine, at two percent of the nitrogen rate. The level of exchangeable NH+4 found on August 8, and October 29, 1978 was significantly increased by addition of this nitrification inhibitor. Residual NH4 from the 1978 treatments increased both leaf N and dry matter production in the succeeding rye cover crop. Corn grain yields were not significantly influenced by potassium treatments due chiefly to inherently high potassium fertility on the test site. Nitrogen source effects varied with both lime and irrigation treatments.
W80-04871

THE USE OF THE CLIMATIC WATER BUDGET IN IRRIGATION SCHEDULING: IOWA,
Delaware Univ., Newark. Dept. of Geography.
J. R. Mather, and A. DeNardo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182140, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, University of Delaware Report, July 1978. 25 p, 2 Fig, 1 Tab, 2 Append. OWRT A-040-DEL(7), 14-34-0001-9008.

Descriptors: Irrigation, *Water budget, *Irrigation programs, Iowa, *Agroclimatology, *Irrigation scheduling, Water utilization, Evapotranspiration, Precipitation(Atmospheric).

Scheduling the correct amount of supplemental irrigation is a problem facing all irrigators. While various techniques have been developed to permit calculation of time and amount of irrigation needs, most are so complex or require so many data that they cannot be evaluated by the individual farmer or irrigation operator. A simplified irrigation scheduling procedure using average information on the climatic demand for water (evapotranspiration) and the precipitation as measured at the particular irrigation site is described. While the approach can be applied anywhere, this primer provides evapotranspiration information only for Iowa. Sample worksheets for irrigation scheduling are included.
W80-04876

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE USE OF THE CLIMATIC WATER BUDGET IN WATER RESOURCES MANAGEMENT AND CONTROL,
Delaware Univ., Newark. Dept. of Geography.
J. R. Mather.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180623, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Center, University of Delaware, Research Technical Completion Report, November 1979. 8 p. OWRT A-040-DEL(2), 14-34-0001-9008.

Descriptors: *Hydrologic budget, *Water balance, *Climatology, *Water management, Irrigation, Streamflow, Landfills, Leaching, Land use effects, Computer models.

Comparison of the monthly or daily climatic supply of water (precipitation) with the climatic demands for water (evapotranspiration) in a water budget accounting framework results in quantitative information on such factors as recharge of water to the water table, streamflow, irrigation need, and storage of moisture in the soil. The information is needed by planners, engineers, agriculturalists, hydrologists and others who are concerned with water resources and their modification by human or natural actions. The results of the study have been presented in a series of primers which describe how the climatic water budget can be adapted to solve particular water problems. Each of the primers is complete, containing all of the information and tables needed to evaluate the water budget along with detailed instructions on how the water budget information can be used in the particular example. Titles of the six primers are: WATBUG: A FORTRAN IV Algorithm for Calculating the Climatic Water Budget; The Use of the Climatic Water Budget in Irrigation Scheduling: Iowa; The Use of the Water Budget in Evaluating Leaching Through Solid Waste Landfills; The Influence of Land-Use Change on Water Resources; Use of the Climatic Water Budget to Estimate Streamflow; The Use of the Climatic Water Budget to Evaluate the Validity of a Precipitation Record.
W80-04872

INTERSTATE RIVER COMPACTS: IMPACT ON COLORADO,
Upper Colorado River Commission, Salt Lake City, UT.
For primary bibliographic entry see Field 6E.
W80-04930

GLOBAL WATER LAW SYSTEMS AND WATER CONTROL,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6E.
W80-04932

ADMINISTRATIVE WATER RIGHTS INSPECTIONS IN CALIFORNIA,
For primary bibliographic entry see Field 6E.
W80-05000

4B. Groundwater Management

WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NYE COUNTY, NEVADA 1976-77,
Geological Survey, Carson City, NV. Water Resources Div.
R. L. Carson.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO 80225, Paper copy $3.24, Microfiche $3.50. Geological Survey open-file report 79-742, 1979. 22 p, 9 Fig, 2 Tab, 7 Ref.

Descriptors: *Basic data collections, *Groundwater resources, *Nevada, *Spring waters, *Water level fluctuations, Irrigation, Pumping, Irrigation wells, *Devils Hole area(Nev), Fish, Endangered species, *Pupfish.

This report presents water data collected in Devils Hole and vicinity from July 1976 through June 1977 for the purpose of observing the effects of irrigation pumping on the pool level in Devils Hole, Nye County, Nevada. The pool contains the endangered species of pupfish, Cyprinodon diabolis. The report presents changes in water level and springflow in graphic form and tabulates electric energy consumed by irrigation wells as an index of the pumpage. (Kosco-USGS)
W80-04853

BOREHOLE GEOPHYSICS IN IGNEOUS AND METAMORPHIC ROCKS,
Geological Survey, Denver, CO. Water Resources Div.
W. S. Keys.
In: Transactions of Twentieth Annual Logging Symposium, Society of Professional Well Log Analysts held in Tulsa, Oklahoma, June 3-6, 1979. 26 p, 21 Fig, 1 Tab, 12 Ref. Society of Professional Well Log Analysts, Houston, Texas.

Descriptors: *Borehole geophysics, *Ingenous rocks, *Metamorphic rocks, *Logging(Recording), Wells, Computer models, Geothermal studies, Exploration, Radioactive wastes, Fractures(Geologic), Thermal water, Borehole cameras, Hydrogeology.

Activities in geothermal energy, radioactive and industrial waste disposal, mineral exploration, engineering geology, and lunar and deep crustal exploration have increased the need for borehole geophysics in igneous and metamorphic rocks. Because there is a lack of knowledge and experience in the application of borehole geophysics to these rocks, the U.S. Geological Survey is conducting research in this area. Igneous and metamorphic rocks usually present different petrophysical properties, such as porosity, density, resistivity, and mineralogy, than do sedimentary rocks. For this reason all conventional geophysical logging techniques may not be useful and petrophysics must be used to develop appropriate methods of log analysis. Core analyses plotted against log response and crossplotting of various logs in the computer are particularly useful for identifying the various rock types in an igenous complex. Hydrothermal alteration and fluid movement through fractures are very important parameters that are needed from logs. Hydrothermal alteration may be recognized on well logs through the use of crossplots and borehole gamma spectrometry. The acoustic televiewer supported by other logs has been highly successful for identifying fractures that are transmitting either hot or cold water. (Kosco-USGS)
W80-04887

GROUNDWATER AUGMENTATION PLANS IN COLORADO,
For primary bibliographic entry see Field 6E.
W80-04928

WATER DISTRICT'S NEEDS ARE MET,
UOP, Inc., St. Paul, MN. Johnson Div.
G. M. Erickson.
The Johnson Drillers Journal, Vol 52, No 1, p 2-3, January-February, 1980. 1 Fig.

Descriptors: *Subsurface investigations, *Drilling, *Ground water resources, *Kentucky, Water wells, Water districts, Rural water, Aquifer testing, Drawdown, Transmissivity, Specific capacity, Well fields, Safe yield, Ohio River, Sand aquifers, Test wells, Groundwater potential, Aquifer management.

The Ohio River-Oldham Water District of northeastern Kentucky engaged the Reynolds Company of Louisville to search for ground water sources near Westport. A good coarse sand and gravel aquifer was located and tested. A 32-inch diameter well was drilled by revere circulation. The well screen and gravel pack were specially designed and constructed to maximize the transmitting capacity to nearly 1500 gpm. Results of the aquifer test indicated a transmissivity of 40,000 to 45,000 gpd per ft and a specific capacity of 19.45 gpm per ft. of drawdown indicating a well efficiency of 85 percent. A test well, drilled closer to the Ohio River indicated that the aquifer became thinner and finer. Three more test wells were drilled in order to fully explore the well field potential. Based on the results of this exploration program, the Ohio River-Oldham Water District now has four completed production wells with safe yields as high as 1.7 mgd and totaling 5.5 mg. (Purdin-NWWA)
W80-05082

THE CASE FOR ARTIFICIAL RECHARGE,
Igrea Group, C.A., Caracas (Venezuela).
J. M. Espina.
The Johnson Drillers Journal, Vol 52, No 1, p 7-11, January-February, 1980. 1 Fig.

Descriptors: *Artificial recharge, *Ground water recharge, Water spreading, Pit recharge, Furrow systems, Injection wells, Induced infiltration, Recharge wells, Aquifers, Clogging, Benefits, Water storage, Conjunctive use, Surface-ground water relationships.

Artificial recharge can be used for waste disposal, secondary oil recovery, land subsidence problems, salt-water intrusion control, and ground water storage. Various methods of artificial recharge include: water spreading, pit recharge, excavations, wells and shafts, and pumping. Water spreading can be done in a basin, a series of ditches or furrows, a natural stream channel, or irrigation canals. Alternating wet and dry periods in a basin results in greater total recharge than continuous spreading. Water spreading is not effective in areas where subsurface strata restrict the downward passage of water or where the cost of land is prohibitive. In these areas recharge can be conducted through injection wells. Recharge rates rarely equal pumping rates due to clogging of the aquifer with silt and bacteria. Induced recharge involves pumping of ground water from a well adjacent to a lake or stream and can result in high-quality water. The tangible and intangible benefits of artificial recharge are outlined along with the physical requirements for appropriate storage, movement and use of recharge water. The major alternative, surface storage, costs more to construct and is subject to evaporation losses and seasonal availability of water. (Purdin-NWWA)
W80-05098

4C. Effects On Water Of Man's Non-Water Activities

THE INFLUENCE OF LAND-USE CHANGE ON WATER RESOURCES,
Delaware Univ., Newark. Dept. of Geography.
J. R. Mather.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180904, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center, University of Delaware, Technical Research Report, June 1979. 60 p, 3 Fig, 14 Tab, 9 Ref, Append. OWRT A-040-DEL(6), 14-34-0001-9008.

Descriptors: *Land development, *Effects, *Groundwater, *Water table, Land use, Land clearing, Hydrologic budget, Water balance, Groundwater recharge, Runoff, Overland flow, Streamflow, Climatology.

This report provides detailed examples of the hydrologic consequences of two specific land-use changes. The first involves the effect on streamflow of a gradual change from cultivation to suburbanization in a basin near Wilmington, Delaware, while the second involves the effect on recharge to the water table of introducing a suburban housing development in a formerly agricultural and wooded tract. Both examples make use of information developed from the climatic water budget. In the first example, it is found that the gradual change from forest and cultivation to suburbanization has resulted in a progressive increase in stream runoff averaging about 0.04 inch per year over the past 30 years. In the second example, increasing the amount of impervious surfaces decreases ground water recharge. In order to have no detrimental effect on the water table recharge, detention (by means of some sort of infiltration basins or ponds) of about one-half of the water falling on impervious surfaces in the housing development is necessary in order for the water table recharge after development to equal the recharge before development.
W80-04873

COASTAL LAND USE CONTROL IN SWEDEN,
San Diego Univ., CA. School of Law.
For primary bibliographic entry see Field 6E.
W80-04920

SAVING CALIFORNIA'S COAST: THE COASTAL ZONE INITIATIVE AND ITS AFTERMATH,
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6E.
W80-04924

THE ROLE OF WATER IN THE HISTORY AND DEVELOPMENT OF COLORADO,
For primary bibliographic entry see Field 6E.
W80-04931

THE PRESSURE FOR SHORELINE DEVELOPMENT: SPATIAL CONCEPTS IN REVIEW,
Ottawa Univ. (Ontario).
For primary bibliographic entry see Field 6E.
W80-04991

PORT AUTHORITIES VIEW STATE COASTAL MANAGEMENT PROGRAMS,
Maine Dept. of Transportation, Portland. Bureau of Waterways.
For primary bibliographic entry see Field 6E.
W80-05094

4D. Watershed Protection

SUSPENDED SEDIMENT FROM FOREST ROAD CONSTRUCTION,
Washington Univ., Seattle. Coll. of Forest Resources.
D. D. Wooldridge, and A. G. Larson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180508, Price codes: A05 in paper copy, A01 in microfiche. State of Washington Water Research Center, Washington State University, Pullman Project Completion Report October 15, 1978, Revised January 1980. 78 p, 14 Fig, 2 Tab, 14 Ref, 1 Append. OWRT A-088-WASH(1).

Descriptors: *Suspended load, *Sediments, *Forest management, *Road construction, Washington, Turbidity, Suspension, Sediment control, Rainfall-runoff relationships, Water sampling, Precipitation(Atmospheric), Erosion, Grading, Roadbanks.

Concentrations and total quantities of suspended sediment in portions of Fly Creek, an undisturbed tributary of the Clearwater River in western

Washington, were studied during the construction of 1.4 miles of unpaved forest road in the watershed. Fly Creek is a Class A, Excellent, stream with a watershed of 649 acres. Approximately 90% of the 140 to 200 inches of annual precipitation becomes streamflow. The road was constructed in accordance with the Best Management Practices defined by the Washington State Forest Practices Rules and Regulations. Sediment concentrations were determined from water samples taken with ISCO automatic samplers that withdraw 500 ml of water at selected intervals. Only visually turbid samples were analyzed and suspended sediment was measured in mg/l. In the laboratory, a Hach model 2100A turbidometer was used to determine the turbidity. Results show that suspended sediment increased both during and after road construction and that sediment concentrations from the construction were related to the proximity of the construction to the stream and the occurrence of rainfall. Sediment increases were small during construction or log hauling during periods without rainfall. Sediment increases were not dependent on work hours or stream discharge. Sediment increases generally occurred on days after construction or hauling was stopped due to rain. A major impact of the road construction was the rapidness with which rainfall causes the suspended sediment increases. (Seigler-IPA)
W80-04808

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

COASTAL WATER POLLUTION AROUND TIBER RIVER MOUTH--A CASE STUDY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 5B.
W80-04840

TECHNIQUES FOR EXPLORING AND PRESENTING DATA APPLIED TO LAKE PHOSPHORUS CONCENTRATION,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 7C.
W80-04843

ANALYSIS OF GROUND WATER BY DIFFERENT LABORATORIES -- A COMPARISON OF CHLORIDE AND NITRATE DATA, NASSAU AND SUFFOLK COUNTIES, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
B. G. Katz, and R. K. Krulikas.
Geological Survey open-file report 79-1063, 1979. 8 p, 2 Fig, 2 Tab, 6 Ref.

Descriptors: *Groundwater, *Analytical techniques, *Laboratory tests, *Water quality, *Water pollution sources, Chlorides, Nitrates, Water wells, Sampling, Statistical analysis, New York, *Nassau County(NY), *Suffolk County(NY).

Water samples from wells in Nassau and Suffolk Counties were analyzed for chloride and nitrate. Two samples were collected at each well; one was analyzed by the U.S. Geological Survey, the other by a laboratory in the county from which the sample was taken. Results were compared statistically by paired-sample t-test to indicate the degree of uniformity among laboratory results. Chloride analyses from one of the three county laboratories differed significantly (0.95 confidence level) from that of a Geological Survey laboratory. For nitrate analyses, a significant difference (0.95 confidence level) was noted between results from two of the three county laboratories and the Geological Survey laboratory. The lack of uniformity among results reported by the participating laboratories indicates a need for continuing participation in a quality-assurance program and exercise of strong quality control from time of sample collection through analysis so that differences can be evaluated. (Kosco-USGS)
W80-04852

APPLICATION OF ENZYME METHODS TO THE DETERMINATION OF POLLUTANTS IN WATER,
Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
K. M. Shahani.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-181167, Price codes: A03 in paper copy, A01 in microfiche. Nebraska Water Resources Center, University of Nebraska Project Completion Report, March 1980. 27 p, 3 Fig, 15 Tab. OWRT A-040-NEB(3), 14-34-0001-5027.

Descriptors: *Enzymes, Whey, Immobilized enzymes, Alcohol, *Pollutants, *Sewage effluents, Streams, Sampling, Biochemical oxygen demand.

Composite sewage samples were collected from a local dairy's effluent stream and analyzed for proximate composition, pH and BOD. Of the total BOD, lactose contributed 60%, protein 25% and lipid 15%. Enzymatic hydrolysis of these components increased the initial rate of utilization by the sewage microflora, but had no significant effect on the five-day BOD. The enzymes lactase, papain and lipase were immobilized either singly or together on a derivitized Sepharose solid support and used for the hydrolysis of lactose, protein and lipid in whey. Immobilization increased the stability of the enzymes without significantly altering their activity, pH optimum, temperature optimum or kinetic parameters. This multi-enzyme immobilized system offers promise for preparation of a hydrolyzed whey product. Proteins were recovered by precipitation with salt or heat or by ultrafiltration and the resultant permeate subjected to further reclamation. An immogilized lactase system was used for the continuous hydrolysis of the lactose in the permeate. The hydrolyzed product was quite sweet and could be used as a food grade syrup. The lactose in the whey permeate was converted to alcohol by the yeast Kluyveromyces fragilis. The permeate was used alone or in combination with grain to produce industrial alcohol for use in gasohol. Substitution of the whey for part of the grain mash water added additional fermentable carbohydrate and allowed a 15% reduction in grain with no decrease in alcohol production.
W80-04868

THE USE OF THE WATER BUDGET IN EVALUATING LEACHING THROUGH SOLID WASTE LANDFILLS,
Delaware Univ., Newark. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W80-04875

WATER ANALYSIS IN SOUTH AFRICA: INTERLABORATORY COMPARISON STUDIES. PART VI: BORON, SILICON, MBAS, CYANIDE, PHENOL, SULPHIDE, BOD, COLOUR AND TURBIDITY, ANALYSES,
National Inst. for Water Research, Pretoria (South Africa).
R. Smith.
Water S. A., Vol 6, No 1, p 31-36, January 1980. 4 Tab, 13 Ref.

Descriptors: *Water quality, *Laboratory tests, *Water analysis, *Analytical techniques, Turbidity, Boron, Silica, Phenols, Sulfides, Biochemical oxygen demand, Statistical methods, Laboratory equipment, Color, Standards, Instrumentation, Reliability, South Africa.

Synthetic water samples were analyzed in 14 South African laboratories for interlaboratory comparison of results on nine water quality parameters. The parameters were boron, silicon, methylene blue active substances (MBAS), cyanide, phenol, sulfide, biochemical oxygen demand (BOD), color, and turbidity. Laboratories were allowed complete freedom of choice in the selection of analytical procedures used. Laboratories were supplied with 250 cu cm samples and were assigned code numbers known only to that laboratory and to the study originator. Not all laboratories tested for all parameters. Collected results were reviewed for outliers using the ASTM procedure and were then analyzed for mean, mean error, relative mean error, standard deviation, and coefficient of variation. Using statistical procedures 80% of the results were found to be acceptable, 20% acceptable but questioned, and no results were unacceptable. Brief descriptions are given for each parameter including how many laboratories tested for it, methods used, and equipment used. Recognized standard methods or slight modifications were generally used and overall satisfactory results were obtained. The relative reliability of analytical methods for cyanide, phenol, sulfide, and BOD could not be determined due to insufficient results. For MBAS determination is recommended that linear alkylate sulfonate be used as the standard reference material. For turbidity determination the use of the Hach Turbidimeter Model 2100 or 2100A is recommended. (Seigler-IPA)
W80-04885

WATER ANALYSIS IN SOUTH AFRICA: INTERLABORATORY COMPARISON STUDIES. PART VII: CONCLUSIONS,
National Inst. for Water Research, Pretoria (South Africa).
R. Smith.
Water S. A., Vol 6, No 1, p 37-40, January 1980. 2 Tab, 11 Ref.

Descriptors: *Water quality, *Laboratory tests, *Water analysis, *Analytical techniques, Statistical methods, Laboratory equipment, Standards, Instrumentation, Reliability, Water pollution, Testing procedures, Evaluation.

Interlaboratory comparison studies involving the analysis of synthetic water samples by 18 laboratories in South Africa were conducted from 1976 through 1978. In all 48 water quality parameters were assessed although all parameters were not analyzed in all laboratories. The specific parameters and the number of laboratories participating are given. Results from each laboratory were statistically assessed and compared to develop a comprehensive picture of the state of water analysis in South Africa. The testing laboratories used a wide variety of both standard and non-standard methods. Due to this variety it is recommended that a recognized set of standard methods for water and waste water analysis be developed. Overall results were good and all laboratories participating would qualify for certification in the Oklahoma laboratory certification program. Specific findings and recommendations include: (1) pH and alkalinity should be determined immediately after opening the sample container; (2) specific conductance determinations should be carried out at 25C; (3) for total alkalinity determination potentiometric titration should be used for more accurate results; (4) for arsenic and selenium determinations by atomic absorption, sodium borohydride should be used as the hydride generant; and (5) for turbidity a Hach Turbidimeter Model 2100 or 2100A should be used. Participating laboratories are listed. (Seigler-IPA)
W80-04886

TEMPERATURE AND ADAPTATION TO POLLUTION AS FACTORS INFLUENCING THE ACUTE TOXICITY OF CD TO THE PLANKTONIC COPEPOD ACARTIA CLAUSI,
Athens Univ. (Greece). Zoological Lab. and Museum.
M. Moraitou-Apostolopoulou, G. Verriopoulos, and P. Palla.
Tethys, Vol 9, No 2, p 97-101, 1979. 1 Fig, 2 Tab, 29 Ref.

Descriptors: *Bioassay, *Cadmium, *Copepods, Water temperature, Adaptation, Lethal limit, Toxicity, Mortality, Zooplankton, Bioindicators, Heavy metals, *Acartia.

Static acute toxicity bioassays were conducted with Cd Cl2,2H20 using adult females of the planktonic Copepod A. clausi. The experiments were run at two temperatures: 14 + or - 0,5C and 22 +

or - 0,5C on natural Copepods assemblages from two different locations: one from an area polluted with industrial effluents and domestic wastes and another one from a relatively clean area. Results of cadmium toxicity tests, expressed as LC 50 48 hours, indicate a significant difference in the tolerance to cadmium between the two populations. Furthermore, for both populations the increase in temperature from 14 to 22C resulted in a two fold increase in the sensitivity of Acartia to cadmium. (Deal-EIS)
W80-04891

FIRST RECORD OF A BLOOM OF GONYAULAX MONILATA IN COASTAL WATERS OF MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
H. M. Perry, K. C. Stuck, and H. D. Howse.
Gulf Research Reports, Vol 6, No 3, p 313-316, 1979. 3 Fig, 10 Ref.

Descriptors: *Dinoflagellates, *Red Tide, *Gulf of Mexico, Mississippi, Marine algae, Coastal waters, Growth rates, Water temperature, Salinity, Nuisance algae, Cytological studies, Florida, Alabama, Louisiana, *Gonyaulax, Public health.

Data are presented on a bloom of the toxic dinoflagellate Gonyaulax monilata in coastal waters of Florida, Alabama, Mississippi and Louisiana. The initial outbreak of the G. monilata bloom followed a period of lowered salinities in Mississippi Sound due to heavy rains associated with Hurricane Bob (11 July) and Tropical Storm Claudette (23 July). Surface temperatures and salinities during the bloom ranged from 30.0 to 30.8C and 24.0 to 26.0 ppt, respectively. Extensive blooms of G. monilata occurred in Florida and Alabama concurrent with the Mississippi outbreak. This is the first record of a bloom of this species in Mississippi and adjacent Gulf of Mexico. (Deal-EIS)
W80-04892

EFFECTS ON FISH EXPOSED TO EFFLUENT FROM A TITANIUM DIOXIDE INDUSTRY AND TESTED WITH ROTATORY-FLOW TECHNIQUE,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
K-J. Lehtinen.
Ambio, Vol 9, No 1, p 31-33, 1980. 2 Fig, 2 Tab, 20 Ref.

Descriptors: *Toxicity, *Fish behavior, *Metals, Chemical wastes, Industrial wastes, Perches, Analytical techniques, Methodology, Fish physiology, Animal metabolism, Animal pathology, Mode of action, *Titanium, *Bleak, *Alburnus, Titanium dioxide industry.

It has become evident that such traditional field methods as calculations of species diversity and determinations of biomass in a polluted area are insufficient when the ecological effects of pollutants are to be determined. For this, a method which will detect some physiological malfunction is needed as a complement to traditional field methods. This paper deals with the performance of fish exposed to effluent from a titanium-dioxide industry. A total of 120 fish of two different species were exposed for 14 and 28 days to various concentrations of the effluent and then tested by means of the 'rotary-flow' technique. They displayed a statistically significant decrease in ability to compensate for torque in the rotating current. This is considered to indicate neuromuscular dysfunction and/or other physiological impairment. The most visible effect of the effluent was a brown precipitate on the gills. Fish from the area affected by the factory discharge are known to have a similar precipitate on the gill epithelium. (Deal-EIS)
W80-04906

A ROUTINE WATER MONITORING TEST FOR MUTAGENIC COMPOUNDS,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
J. B. Johnston, and J. N. Herron.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-181761, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Center, University of Illinois Research Report 141, May 1979, 94 p. S-057-ILL.

Descriptors: *Mutagens, *Ames assay, *Parfait/distillation method, Potable water, *Surface waters, Water analysis, Chemical analysis, Mutagenic chemicals, Water pollution, Public health, *Carcionogens.

The development of a simple, relatively comprehensive method for the recovery of nonvolatile mutagenic compounds from surface waters is described. The method recovers compounds by sequential passage of the water sample through a silica gel bed, then a cation-exchange bed, and then an anion-exchange bed - all contained in a single multi-bed column of glass and teflon, the parfait column. Nonvolatile compounds not adsorbed to any of these beds were recovered following concentration of the column effluent by vacuum distillation at < 30 degrees. The beds of the parfait column were separated and eluted independently. Using the Ames Salmonella/microsome reversion assay, each residue was assayed for mutagenic activity. The method was evaluated by recovery of five known mutagens, benzo(a)pyrene, 4-nitroquinoline-1-oxide, ethidium bromide, nitrofurylfuramide, and solium azide, each initially spiked into a sample of laboratory deionized water and an environmental water sample to a final concentration of less than 3ppb. The method has been used to survey ten Illinois surface waters for naturally occurring mutagenic activity. The parfait/distillation method differs from other techniques for the recovery of waterborne mutagens in its emphasis on the recovery of nonvolatile compounds and neutral water-soluble compounds. This method has also detected a significant mutagenic activity in samples as small as 2 gallons of water, a volume consumed by a normal person every few days. W80-04937

HIGH FREQUENCY TEMPERATURE FLUCTUATIONS IN A POWER-PLANT THERMAL PLUME,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W80-05009

THE ACID-BASE BALANCE IN LAKE WATER,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 2H.
W80-05016

FRESHWATER PHYTOPLANKTON FROM THE NARSSAQ AREA, SOUTH GREENLAND,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 2H.
W80-05018

SHORT-TERM RESPONSES OF NUTRIENT-DEFICIENT ALGAE TO NUTRIENT ADDITION,
Department of Fisheries and Oceans, Winnipeg (Manitoba). Freshwater Inst.
F. P. Healey.
Journal of Phycology, Vol 15, No 3, p 289-299, September 1979. 8 Fig, 3 Tab, 61 Ref.

Descriptors: *Scenedesmus, *Photosynthesis, *Respiration, *Metabolism, *Analytical techniques, *Nutrient requirements, *Limiting factors, Chlorophyta, Kinetics, Phosphorus, Nitrogen, Nutrients bioassay, Ammonium compounds, Phosphates, Cultures, Laboratory tests, Population dynamics, Population, Growth rates, Plant physiology, Cytological studies, Algae.

Experiments studying phosphate of ammonium additions to green alga Scenedesmus quadricauda cultures deficient in phosphorus (P) or nitrogen (N), show that photosynthetic responses cannot reliably be used in short-term enrichments, rather changes in dark respiration or ATP are useful. Enrichment experiments involving small water volumes and population growth do not measure real but only potential nutrient limitations after other limiting factors, natural loading and regeneration have been removed. Experiments suffer from changing species composition and declining growth rates. To determine nutrient deficiencies actually present in a population, physiological indicators need to be measured. Photosynthetic responses are not appropriate. On the basis of experiment results, changes in dark respiration or ATP content are appropriate responses in some situations. The present results are confined to growth of Scenedesmus quadricuada the first eight h following addition and therefore indicate only possible solutions. The deficient nutrient is rapidly taken up. Light-saturated net photosynthesis is depressed below pre-addition rates during nutrient uptake and does not increase until several hours after uptake is complete. Dark respiration, on the other hand, is markedly stimulated during nutrient uptake and to a lesser extent after uptake is complete. Phosphate addition to P-deficient cells cause large increases in ATP content within 2-4 h of addition, whereas ammonium addition to N-deficient cells causes much less or no increase in ATP content. (Danovich-Wisconsin)
W80-05022

DISTRIBUTION AND ABUNDANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS AND SUSPENDED HYDROCARBONS IN COOK INLET, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
J. Cline, C. Katz, and A. Young.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol V, Receptors--Microbiology, Contaminant Baselines, p 264-325, October 1979. 28 Fig, 2 Tab, 40 Ref. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Aromatic compounds, *Toxicity, *Natural gas, *Pollutant identification, Water pollution effects, Resources development, Environmental effects, Baseline studies, Oil pollution, Alaska, *Outer Continental Shelf, Cook Inlet, Crude oil, Hydrocarbons, Anthropogenic sources, Petroleum development, Toxicants.

During the past two years, emphasis has shifted toward sources of low molecular weight (LMW) hydrocarbons in Cook Inlet, including both natural and anthropogenic sources. Special attention has been devoted to sources of LMW aromatics in upper Cook Inlet and the fate of these compounds. Specialized studies in Cook Inlet have continued on the air-sea exchange of LMWH and in-situ production of gases in both the water column and from the underlying sediments. These data provide necessary information for the identification and sources of petroleum-like hydrocarbons in the waters of Cook Inlet. These studies were enacted to characterize the dissolved LMW natural hydrocarbons in Cook Inlet, Alaska. The purpose was to establish concentration levels and temporal and spatial variability of hydrocarbon components common to petroleum or natural gas resources prior to actual production. These measurements were felt to be an invaluable precursor to future monitoring efforts. The principal concern surrounding the distributions, sources, and sinks of LMWH is not their direct impact on biota, but rather their role as tracers of more toxic hydrocarbon fractions commonly found in crude oils. The principal goal is to provide the criteria for an early warning detection of petroleum-derived hydrocarbons and to establish the feasibility of using light hydrocarbons as tracers, particularly in reference to near-bottom mixing and resuspension processes. (Sinha-OEIS)
W80-05062

5B. Sources Of Pollution

TRACE METALS IN SUSPENDED PARTICULATES, BIOTA, AND SEDIMENTS OF THE ST.

CROIX, NARRAGUAGUS, AND UNION ESTUARIES AND THE GOOSE COVE REGION OF PENOBSCOT BAY,
Maine Univ. at Orono. Dept. of Oceanography.
L. K. Fink, A. B. Harris, and L. L. Schick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-181456, Price codes: A05 in paper copy, A01 in microfiche. Maine Land and Water Resources Center Maine University Completion Report. April 1980. 296 p, 177 Fig, 22 Tab, 32 Ref. OWRT A-041-ME(1) and B-015-ME(1).

Descriptors: *Maine, *Estuaries, *Heavy metals, *Water pollution sources, Water quality, Sediments, Suspended solids, Biota, Agricultural runoff, Mining, Industrial wastes, Sewage effluents, Spectrophotometry, Watersheds(Basins), Brackish water.

Samples from four Maine estuaries were analyzed to determine the concentrations, distributions, and sources of heavy metals (Ag, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn) in their suspended particulates, sediments, and biota. The four estuaries studied and their dominant impacting anthropogenic activity are: the St. Croix River, pulp and paper processing; the Narraguagus River, agricultural activity; the Union River, untreated town sewage; and Goose Cove (Penobscot River), mining activity. Sampling sites for each estuary were located both above and below the principal pollution injection sources. Particulate matter samples were taken at both near-surface and near-bottom stations. Animal and plant samples were collected intertidally and as many species as possible were taken at each site. Sediment cores were taken at each site using either standard piston coring or hand coring. A Jarrell-Ash 810 Atomic Absorption Spectrophotometer was used for all analyses. For both the Narraguagus and Union Rivers no significant heavy metal concentration increases were found as a result of the anthropogenic activities in their watersheds. However, increased concentrations of metals were found for the St. Croix River and Goose Cove. Overall results show that long-term compartments such as sediments and especially the fine fraction of sediments are most likely to contain elevated levels of metals while short-term compartments such as biota and suspended particulates are less likely to contain the higher levels. (Seigler-IPA)
W80-04809

SOME LIMITATIONS OF WATER QUALITY MODELS FOR LARGE LAKES: A CASE STUDY OF LAKE ONTARIO,
National Water Research Inst., Burlington (Ontario).
T. J. Simons, and D. C. L. Lam.
Water Resources Research, Vol 16, No 1, p 105-116, February 1980. 7 Fig, 5 Tab, 19 Ref, 1 Append.

Descriptors: *Water quality, *Lakes, *Lake Ontario, *Model studies, Mathematical models, Nutrients, Sediments, Pollutants, Path of pollutants, Sediment transport, Phosphorus, Water pollution, Water pollution sources, Limnology, Water quality models.

Some of the problems encountered in the design of a predictive water quality model for a large lake were discussed with reference to Lake Ontario and within the framework of a simple dynamic phosphorus model which incorporates the essential mechanisms of complex plankton models. By fitting the model to a seasonal data base it was shown that equally satisfactory simulations are obtained with a variety of parameterizations and regardless of conditions of annual periodicity imposed on the solution. By comparison of model output with long-term observations it was demonstrated that seasonal verification studies of dynamic models by themselves are not sufficient to diagnose the utility of such models for predicting long-term trends. It was concluded that the uncertainty surrounding the formulation of sedimentation and nutrient regeneration, in conjunction with the sensitivity of models to assumptions regarding dynamic balance between lake concentrations and nutrient loadings, undermines the predictive capability of dynamic water quality models. (Sims-ISWS)
W80-04818

DIFFUSION OF A PASSIVE SCALAR WITH RANDOM ADVECTION,
Oak Ridge National Lab., TN.
J. E. Molyneux, and A. J. Witten.
Water Resources Research, Vol 16, No 1, p 137-144, February 1980. 4 Fig, 9 Ref, 1 Append.

Descriptors: *Diffusion, *Streamflow, *Pollutants, *Path of pollutants, *Model studies, Mathematical models, Probability, Statistics, Stochastic processes, Mass transfer, Streams, Rivers, Flow, Mixing, Water pollution.

To investigate the instantaneous release of a passive additive into a flow, it was assumed that the concentration of the additive is governed by the one-dimensional advective diffusion equation in which the advecting flow velocity is a given time-dependent stochastic process. Both the one- and two-space-time point probability distributions of the random concentration field were determined. This problem, or more elaborate variations of it, is a rather idealized model for a variety of environmentally important flow situations, for example, the accidental or planned release of a contaminant into a river by a power station, and, as such, it has been investigated by a number of authors. Previous treatments, however, have concentrated on deriving information about the statistical moments of the concentration. Although such information is important, it may be inadequate for accessing the true effects of a flow additive on the environment. This investigation demonstrated the possibility of obtaining a more complete statistical description. (Sims-ISWS)
W80-04821

INTERVENTION ANALYSIS WITH MISSING DATA,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W80-04823

DISPERSION IN TWO-LAYER STRATIFIED WATER BODIES,
National Technical Univ., Athens (Greece). Applied Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W80-04833

COASTAL WATER POLLUTION AROUND TIBER RIVER MOUTH--A CASE STUDY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
T. La Noce, R. Pagnotta, M. Pettine, and A. Puddu.
Progress in Water Technology, Vol 12, No 1, p 193-209, 1980. 5 Fig, 3 Tab, 26 Ref.

Descriptors: *Water pollution, *Coasts, *Rivers, *Water pollution sources, Pollutants, Pollutant identification, On-site investigations, Sampling, Heavy metals, Toxins, Eutrophication, Nutrients, Salinity, Temperature, Dissolved oxygen, Chemical oxygen demand, Biochemical oxygen demand, Benthos, Benthic fauna, *Italy, *Tiber River(Italy).

The need to evaluate the impact of the Tiber River on the receiving marine ecosystem, and the extent of pollution abatement required to safeguard the various coastal water uses, promoted an interdisciplinary experimental investigation. First stage results of the investigation carried out off the river mouth were presented. The extension of the area influenced by the river has been estimated at 400 sq km. Due to the river's high nutrient input rates, eutrophic processes occur with an intensity depending on sample distances from the mouth. Some data concerning the limiting factor were also derived. Toxicity studies revealed an incipient threat from Cd and Hg concentration. HCB was only occasionally found in the zone; PCB's were found in surprisingly high levels further away from the river mouth. Bacteriological data led to the conclusion that the river's impact on beach bathing conditions is only limited to an area immediately adjacent to the two outfalls. With the exception of minor changes due to the eurhyaline nature of the zone, no major variation in receiving area ecology was detected (for benthos and nekton). (Sims-ISWS)
W80-04840

THE DETERMINATION OF EDDY DIFFUSION COEFFICIENTS USING NATURAL TRACERS,
Watson (Dagh) S.p.A, Milano (Italy).
A. Denegri, and F. Martini.
Progress in Water Technology, Vol 12, No 1, p 339-344, 1980.

Descriptors: *Dispersion, *Diffusion, *Sewage, *Outfall sewers, Model studies, Mathematical models, Tracers, Salinity, Pollutants, Path of pollutants, Water pollution, Water pollution sources, Coasts, Equations, Mathematics, *Sicily, *Messina(Sicily), *Straits of Messina.

The paper described the development of equations for the calculation of coefficients of eddy diffusion using salinity as a tracer. The results were reported of experimental work carried out in the Straits of Messina to calculate the dispersion of sewage from two proposed outfalls from the City of Messina. The authors concluded that the use of salinity as a tracer has significant advantages over the use of an artificial tracer. In particular this is because the system concerned very closely approximates to the steady state it is assumed to be, unlike that which develops using artificial tracers. Furthermore, the instrumentation involved is simple and of low cost, and the extent of the survey area is much reduced. In the areas studied the variation in salinity was sufficient to enable satisfactory calculation of the diffusion coefficients. (Sims-ISWS)
W80-04841

CHEMICAL AND SEDIMENT MASS TRANSFER IN THE GODAVARI RIVER BASIN IN INDIA,
Jawaharlal Nehru Univ. New Delhi (India). School of Environmental Sciences.
For primary bibliographic entry see Field 2J.
W80-04845

A ONE-DIMENSIONAL, STEADY-STATE, DISSOLVED-OXYGEN MODEL AND WASTE-LOAD ASSIMILATION STUDY FOR SILVER CREEK, CLARK AND FLOYD COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
W. G. Wilber, C. G. Crawford, and J. G. Peters.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO 80225, Paper copy $8.50, Microfiche $3.50. Geological Survey open-file report 79-1253, July 1979. 60 p, 22 Fig, 10 Tab, 47 Ref.

Descriptors: *Model studies, *Dissolved oxygen, *Waste assimilative capacity, *Water quality, *Indiana, Streams, Streamflow, Low flows, Reaeration, Effluents, Forecasting, Water quality standards, Water pollution, Waste water disposal, Waste water treatment, Biochemical oxygen demand, Nitrification, Ammonia, Nitrates, Nutrients, Mathematical models, *Clark County(Ind), *Floyd County(Ind), *Silver Creek(Ind).

The Indiana State Board of Health is developing a State water-quality management plan that includes establishing limits for wastewater effluents discharged to Indiana streams. A digital model calibrated to conditions in Silver Creek was used to develop alternatives for future waste loadings that would be compatible with Indiana stream water-quality standards defined for two critical hydrologic conditions, summer and winter low flows. Effluents from the Sellersburg and Clarksville-North wastewater-treatment facilities are the only point-source waste loads that significantly affect the water quality in the modeled segment of Silver Creek. Model simulations indicate that nitrification is the most significant factor affecting the dissolved-oxygen concentration in Silver Creek during summer and winter low flows. Natural streamflow in Silver Creek during the summer and

annual 7-day, 10-year low flow is zero, so no benefit from dilution is provided. Present ammonia-nitrogen and dissolved-oxygen concentrations of effluent from the Sellersburg and Clarksville-North wastewater-treatment facilities will violate current Indiana water-quality standards for ammonia toxicity and dissolved oxygen during summer and winter low flows. The current biochemical-oxygen demand limits for the Sellersburg and Clarksville-North wastewater-treatment facilities are not sufficient to maintain an average dissolved-oxygen concentration of at least 5 milligrams per liter, the State's water-quality standard for streams. Calculations of the stream's assimilative capacity indicate that Silver Creek cannot assimilate additional waste loadings and meet current Indiana water-quality standards. (Kosco-USGS)
W80-04861

ARSENIC, NITRATE, IRON, AND HARDNESS IN GROUND WATER, CHENA RIDGE VICINITY, FAIRBANKS AREA, ALASKA,
Geological Survey, Fairbanks, AK. Water Resources Div.
A. P. Krumhardt.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO., paper copy $3.50, microfiche $1.00. Geological Survey open-file report 80-49, 1979. 1 Sheet, 9 Ref.

Descriptors: *Water quality, *Groundwater, *Water wells, *Iron, *Hardness(Water), Water analysis, Chemical analysis, Water pollution, Public health, Maps, Alaska, *Fairbanks(Alaska).

The report presents all data on hardness, iron, nitrate and arsenic in well water in the Chena Ridge area of Fairbanks, Alaska, through June 1979. Concentrations range as follows: arsenic - 0 to 28 micrograms per liter; nitrate - 0 to 20 milligrams per liter; iron - 0 to 18 milligrams per liter and hardness - 72 to 1,400 milligrams per liter. Values at the upper ends of the ranges for iron and nitrate exceed limits recommended by the Environmental Protection Agency for public water supplies. A map of the area showing the location of sampled wells and a table of chemical analysis are included. (Kosco-USGS)
W80-04862

THE USE OF THE WATER BUDGET IN EVALUATING LEACHING THROUGH SOLID WASTE LANDFILLS,
Delaware Univ., Newark. Dept. of Geography.
J. R. Mather, and P. A. Rodriguez.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180888, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, University of Delaware Report, October 1978, 39 p, 3 Fig, 4 Tab, 10 Ref, 3 Append. OWRT A-040-DEL(3), 14-34-0001-9008.

Descriptors: *Hydrologic budget, *Landfills, *Leaching, *Solid wastes, Subsurface drainage, Pollutants, Groundwater movement, Path of pollutants, Model studies, Evaluation.

Determination of the volume of leaching through solid waste landfills is a problem of concern to landfill operators everywhere since such leaching may carry pollutants into the local groundwater. The use of a simple yet practical climatic water budget model to calculate possible leaching volume under different landfill conditions is explained and illustrated. The water budget model only requires information on air temperature and precipitation as input. All necessary tables and formulas for evaluating the water budget model are included.
W80-04875

POLLUTION IN THE GREAT LAKES BASIN FROM LAND USE ACTIVITIES.
International Joint Commission-United States and Canada. Great Lakes Regional Office.
Report to the Governments of the United States and Canada, March 1980. 155 p, 5 Fig, 8 Tab, 5 Append.

Descriptors: *Great Lakes, *Water quality, *Water pollution sources, *Land use, Agricultural runoff, Industrial wastes, Lake Erie, Lake Huron, Lake Michigan, Lake Ontario, Lake Superior, Pesticides, Phosphorus, Eutrophication, Sediments, Silting.

In response to a request from the Governments of Canada and the United States, the International Joint Commission conducted an extensive study of the Great Lakes ecosystem and concluded that the Great Lakes are being polluted from land drainage sources. Areas of intensive agricultural and urban use contribute most heavily to this problem by producing pollutants such as phosphorus, sediments, industrial organic compounds, pesticides, and heavy metals. It is estimated that one third to one half of total phosphorus loads in the lakes are attributable to land use activities. The major source of nonpoints loads was cropland especially in highly erodable areas. Approximately 400 organic compounds were identified in the Great Lakes ecosystem including residual levels of DDT, aldrin-dieldrin and chlordane. Other sources of pollution include the atmosphere, siltation, and the disposal of liquid and solid wastes from industry. It is recommended that a comprehensive, basin-wide long-term management strategy, the 'Ecosystem Approach,' be developed to deal with these pollution problems. The areas having the worse water quality problems, Lakes Erie and Ontario, Saginaw Bay, and southern Lake Huron, should be given highest priority for remedial actions. When site-specific measures are needed, the cost-effectiveness of all remedies should be considered. Other areas of concern for remedial action include funding, legislation, coordination levels, and voluntary programs. Some specific remedial programs are recommended. (Seigler-IPA)
W80-04879

STUDIES ON TOXICITIES OF BIPHENYL ETHER HERBICIDES AND THEIR ANALOGUES TO FISH--1. THE METHEMOGLOBIN-FORMATION BY THE NITROSO-DERIVATIVES IN WHITE-SPOTTED CHAR, SALVELINUS LEUCOMAENIS, ERYTHROCYTES,
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
M. Miyauchi, M. Takagi, and T. Uematsu.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 45, No 12, p 1563-1567, 1979. 6 Fig, 19 Ref.

Descriptors: *Pesticide toxicity, *Herbicides, *Animal metabolism, Pesticide kinetics, Chemical reactions, Chemical properties, Enzymes, Biochemistry, Fish physiology, Mode of Action, Biphenyl ether herbicides, *Char, *Salvelinus, *Erythrocytes, *Methemoglobin, *Blood chemistry, *Tissue analysis.

The methemoglobin formation by the nitroso-derivatives of biphenyl ether herbicides (2,4-dichloro p-nitrobiphenyl ether and 2,4,6-trichloro p-nitrobephenyl ether) and their analogues was investigated in suspensions of white-spotted char erythrocytes. All of the nitroso-derivatives used, induced the methemoglobin formation among the nitroso-derivatives was the most potent in nitrosobenzene followed by p-nitrosobiphenyl ether, 4-chloro p-nitrosobiphenyl ether, 2,4-dichloro p-nitrosobiphenyl ether and then 2,4,6-trichloro p-nitrosobiphenyl ether in erythrocytes of both species. This order among the nitroso-derivatives was dependent on the number of chlorine rather than on its position of substitution in the phenoxy group. The mechanism of methemoglobin formation by the nitroso-derivatives was similar in erythrocytes of both species and on the requirement of NADPH-dependent enzyme systems, and that of methemoglobin reduction was similar, too, on reception of NADH-dependent enzymatic process. (See also W80-04890) (Deal-EIS)
W80-04889

STUDIES ON TOXICITIES OF BIPHENYL ETHER HERBICIDES AND THEIR ANALOGUES TO FISH--II. PRODUCTION OF METHEMOGLOBIN-FORMING METABOLITES OF THE AMINO-DERIVATIVES BY WHITE-SPOTTED CHAR, SALVELINUS LEUCOMAENIS, LIVER HOMOGENATE,
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
M. Miyauchi, M. Takagi, and T. Uematsu.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 45, No 12, p 1569-1573, 1979. 5 Fig, 21 Ref.

Descriptors: *Herbicides, *Pesticide toxicity, *Animal metabolism, Fish physiology, Pesticide kinetics, Biochemistry, Path of pollutants, Chemical reactions, Chemical properties, Enzymes, Biphenyl ether herbicides, *Char, *Salvelinus, *Tissue analysis, *Biotransformation, *Erythrocytes, *Methemoglobin, *Blood chemistry, 2,4-dichloro p-nitrobiphenyl ether, 2,4,6-trichloro p-nitrobiphenyl ether.

The activities of liver homogenates from white-spotted char and rat, to metabolize the amino-derivatives of biphenyl ether herbicides (2,4-dichloro p-nitrobiphenyl ether and 2,4,6-trichloro p-nitrobiphenyl ether) and their analogues to methemoglobin-forming metabolites were compared by incubating liver homogenates with the amino-derivatives, a NADPH-generating system and white-spotted char, rat or human erythrocytes. The results indicated that white-spotted char liver homogenates had the ability to metabolize p-aminobiphenyl ether to methemoglobin-forming metabolites although the activity was very low; while rat liver homogenates had the ability to metabolize all the amino-derivatives to methemoglobin-forming metabolites and the rates of methemoglobin formation among the amino-derivatives were the highest in p-aminobiphenyl ether followed by 4-chloro p-aminobiphenyl ether, 2,4-dichloro p-aminobiphenyl ether and then 2,4,6-trichloro p-aminobiphenyl ether. The sensitivity of erythrocytes to the methemoglobin-forming metabolites were the highest in human followed by rat and then white-spotted char erythrocytes. (See also W80-04889) (Deal-EIS)
W80-04890

TEMPERATURE AND ADAPTATION TO POLLUTION AS FACTORS INFLUENCING THE ACUTE TOXICITY OF CD TO THE PLANKTONIC COPEPOD ACARTIA CLAUSI,
Athens Univ. (Greece). Zoological Lab. and Museum.
For primary bibliographic entry see Field 5A.
W80-04891

CADMIUM, ZINC AND COPPER ACCUMULATION IN LIMPETS (PATELLA VULGATA) FROM THE BRISTOL CHANNEL WITH SPECIAL REFERENCE TO METALLOTHIONEINS,
Liege Univ. (Belgium). Lab. d'Oceanography.
F. Noel-Lambot, J. M. Bouquegneau, F. Frankenne, and A. Disteche.
Marine Ecology--Progress Series, Vol 2, p 81-89, 1980. 8 Fig, 4 Tab, 45 Ref.

Descriptors: *Cadmium, *Absorption, *Invertebrates, Zinc, Copper, Animal metabolism, Animal physiology, Heavy metals, Mode of Action, Path of pollutants, Mollusks, Bristol Channel, England, *Metallothioneins, *Limpets, *Patella, *Bioaccumulation, *Tissue analysis.

The study of metal concentrations in Patella vulgata caught from a polluted environment reveals a direct relationship between Cd concentration and body size and an inverse relationship in regard to Zn and Cu. Most of the Cd present in limpets with heavy Cd loads is bound to thioneins, but this is not the case for Zn and Cu. In young limpets, Cd-thioneins were not detected. All results indicate that during long-term Cd intoxication under field conditions, Cd deposition and increase in metallothioneins in limpets were directly linked. The induced production of metallothioneins may thus be considered as the main mechanism responsible for the cumulative absorption of Cd in limpets living in the Bristol Channel. Isolation and characterization of limpet metallothioneins were performed. They indicate that mollusc metallothioneins are very similar to those from vertebrates. (Deal-EIS)
W80-04893

RELATIONSHIP BETWEEN THE BODY SIZE OF PRINCIPAL SHELLFISH AND THE CONCENTRATION OF FEW HEAVY METALS (IN JAPANESE),
Iwate Prefectural Office (Japan). Forestry and Fishery Div.
S. Kamimura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 46, No 1, p 79-82, 1980. 4 Fig, 2 Ref. (English summary).

Descriptors: *Heavy metals, *Absorption, *Commercial shellfish, Bioindicators, Mathematical models, Oysters, Path of pollutants, Animal metabolism, Animal physiology, Weight, Mercury, Copper, Zinc, Cadmium, *Scallops, *Abalones, *Bioaccumulation, *Tissue analysis.

It is important to clarify the concentration of heavy metals in aquatic organisms under normal conditions in order to evaluate heavy metal pollution. For this purpose the normal levels of a few heavy metals in the cultured scallops, oysters and abalones were determined from the relationship between the body weight and the concentration of heavy metals. The results obtained showed that the concentration of each heavy metal in the soft parts increased with the increase of body weight. The relationship was especially significant in the mid-gut gland including stomach of scallops. These results suggest the existence of a characteristic pattern of heavy metal accumulation for each species. The pattern observed in the mid-gut gland of scallops together with that in the soft parts may be available as a biological index for the evaluation of heavy metal pollution in environmental sea water. (Deal-EIS)
W80-04894

CONCENTRATION AND DISTRIBUTION OF URANIUM IN MYTILUS EDULIS AND ASSOCIATED MATERIALS,
Institute for Marine Environmental Research, Plymouth (England).
E. I. Hamilton.
Marine Ecology--Progress Series, Vol 2, p 61-73, 1980. 6 Fig, 8 Tab, 24 Ref.

Descriptors: *Uranium radioisotopes, *Mussels, *Absorption, Path of pollutants, Radioactive wastes, Radioecology, Animal metabolism, Radiochemical analysis, Biochemistry, Seasonal, Bottom sediments, *Tissue analysis, *Bioaccumulation, *Mytilus, *Depuration, *Transuranic elements.

Concentration and distribution of uranium in the mussel Mytilus edulis are described for sampling sites in the United Kingdom near and distant from sources of nuclear effluents; the data reflect natural availability from the marine environment, any effect attributable to the proximity of nuclear effluent discharges being minimal. With the exception of uranium associated with food and particulate materials present in the digestive organ, the highest levels were found associated with byssal threads, the periostracum and the excretory organs. It has been observed that the tanning process associated with the development of byssal threads involves uranium which has a special affinity for SS-SH and disulphide groups in organs. The lowest concentrations of uranium were found in the periostracum-free shell. Depuration experiments have demonstrated that after a fairly rapid loss of uranium from the digestive gland, that which remains within organs and tissues is retained and is associated with the surfaces of organs and tissues. In the sediments uranium is enriched in the finer fraction but no evidence for an excessive enrichment arising from nuclear effluents was observed. (Deal-EIS)
W80-04895

ACCUMULATION AND BIOLOGICAL EFFECTS OF CADMIUM IN RAINBOW TROUT,
Tokai Regional Fisheries Research Lab, Yokosuka (Japan). Arasaki Marine Biological Station.
H. Kumada, S. Kimura, and M. Yokote.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 46, No 1, p 97-103, 1980. 2 Fig, 6 Tab, 25 Ref.

Descriptors: *Cadmium, *Absorption, *Rainbow trout, Heavy metals, Fry, Mode of Action, Path of pollutants, Water chemistry, Fish physiology, Bioassay, Growth rates, Mortality, *Bioaccumulation, *Tissue analysis.

The biological effects and accumulation of cadmium stearate, acetate, and chloride in rainbow trout fingerlings were investigated. No adverse effect was observed on survival, growth and histology of the fish exposed to cadmium compounds via water at a concentration of 4 microg Cd/l for 10 weeks, and also the fish exposed to the same compounds via food at a concentration of 10 mgCd/kg for 12 weeks. However, the fish orally exposed to cadmium stearate of 100 mgCd/kg showed histological changes of a slight degree in their livers and kidneys. Total cadmium loads (microg Cd/fish) decreased prominently in the fish orally exposed to the chemicals 10 weeks after discontinuation of exposure, while those in the fish exposed via ambient water almost remained unchanged during this time. From the results of the present study, it is postulated that the route of cadmium absorption via water chiefly participates in the accumulation of the metal in fishes under natural conditions. (Deal-EIS)
W80-04896

INFLUENCE OF COPPER AND ZINC IN FOOD SUBSTANCE ON THE ACCUMULATION OF CULTURED OYSTERS (IN JAPANESE),
Iwate Prefectural Office (Japan). Forestry and Fishery Div.
S. Kamimura.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 46, No 1, p 83-85, 1980. 1 Fig, 3 Tab, 7 Ref, (English abstract).

Descriptors: *Oysters, *Copper, *Zinc, *Absorption, Aquiculture, Growth rates, Commercial shellfish, Path of pollutants, Heavy metals, Chemical analysis, Water chemistry, Diatoms, *Bioaccumulation, *Tissue analysis.

Living feeds collected at each hanging depth of oyster clumps in sea water of an oyster farm were analyzed for the determination of copper and zinc. The concentration of copper and zinc in oysters cultured at Miyako Bay showed a tendency to decrease according to the hanging depth of oyster clumps, while that in the sea water inversely. The same tendency was also observed in the weight of soft parts of oysters. These results suggest that the growth pattern of cultured oysters, together with the heavy metal accumulation in food substances for oysters, is the principle factor in the characteristics of heavy metal accumulation at each oyster hanging depth. (Deal-EIS)
W80-04897

MELIMEX, AN EXPERIMENTAL HEAVY METAL POLLUTION STUDY: CHEMICAL SPECIATION AND BIOLOGICAL AVAILABILITY OF COPPER IN LAKE WATER,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
P. Baccini, and U. Suter.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 291-314, 1979. 13 Fig, 6 Tab, 26 Ref.

Descriptors: *Copper, *Lakes, *Chemical reactions, Chemical properties, Water chemistry, Sorption, Biomass, Plankton, Hydrogen ion concentration, Heavy metals, Chemical analysis, Seasonal, Copper compounds, *Bioavailability, *Ligands.

The chemical speciation of dissolved copper was investigated in waters from the limno-corrals of the MELIMEX project and compared with speciation data from other Swiss lakes. Copper is complexed primarily by organic ligands having molecular sizes between 10000 and 1000 daltons. The mean concentration of the ligands is approximately 5 x 10 to the minus 7th power mole/mg DOC. The conditional stability constants (pH = 8.8) are about 10 to the 11th power. An increased metal load did not induce an increase of binding ligands. A comparison of calculated Cu2+ concentration with corresponding copper contents in the biomass leads to the conclusion that organic ligands and pH are the most important factors in deciding the biological availability of copper. However, the sorption capacity of the biomass depends as well on the variety of plankton species. (Deal-EIS)
W80-04899

MELIMEX, AN EXPERIMENTAL HEAVY METAL POLLUTION STUDY: BEHAVIOUR OF HEAVY METALS IN AN AQUATIC FOOD CHAIN,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
R. Gachter, and W. Geiger.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 277-290, 1979. 3 Fig, 5 Tab, 30 Ref.

Descriptors: *Food chains, *Heavy metals, *Plankton, Phytoplankton, Zooplankton, Periphyton, Diptera, Lake Trout, Fry, Mercury, Copper, Cadmium, Zinc, Lead, Path of pollutants, Trophic level, Absorption, Sorption, Metabolism, Aquatic insects, *Bioaccumulation, *Tissue analysis.

Phytoplankton, periphyton and zooplankton samples, chironomid and Sialis sp. larvae, and fry of trout and bream collected from unpolluted and artificially metal-polluted limno-corrals were analyzed for mercury, copper, cadmium, zinc and lead. On a dry weight basis, metal concentrations were highest in phytoplankton and periphyton samples, lower in zooplankton, chironomidae and Sialis and lowest in fish, indicating that inorganic Hg, Cu, Cd, Zn and Pb are not accumulated through the food chain and do not reach highest concentrations in highest trophic levels. The results further suggest that increased metal concentrations in the environment favor phytoplankton organisms with a lower metal sorption capacity. This negative feedback mechanism may play an important ecological role by reducing the metal content in organisms at lower trophic level, thereby reducing the danger of adversely affecting the organisms of higher trophic levels which feed upon them. (Deal-EIS)
W80-04900

MELIMEX, AN EXPERIMENTAL HEAVY METAL POLLUTION STUDY: EFFECTS OF INCREASED HEAVY METAL LOAD ON UPTAKE OF GLUCOSE BY NATURAL PLANCTONIC COMMUNITIES,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
P. Bossard, and R. Gachter.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 261-270, 1979. 3 Fig, 3 Tab, 19 Ref.

Descriptors: *Heavy metals, *Inhibition, *Plankton, *Metabolism, Copper, Zinc, Cadmium, Lead, Mercury, Lakes, Seasonal, Water quality standards, Absorption, Carbon radioisotopes, Tracers, Natural selection, *Glucose.

Glucose uptake in lake water samples has been determined with short-time 14C-experiments at different additions of the single heavy metals Cu, Zn, Cd, Pb, Hg and at different additions of a combination of all metals. The degree of metal-induced inhibition of glucose uptake varied from lake to lake and from season to season. The addition of legally tolerated concentrations of 10 microg Cu/l and 200 microg Zn/l inhibited glucose uptake in most samples significantly, as well as the simultaneous addition of all metals. The legally tolerated limit of 1 microg Hg/l inhibited glucose uptake in Lake Lucerne samples almost completely, but showed no effect in samples of Lake Baldegg. The equimolar toxicity sequence of heavy metals for heterotrophic microorganisms has been determined as: Hg>Cu>Cd>(Zn, Pb). Glucose uptake of plankton sampled from metal polluted limno-corrals was less inhibited than that of the control plankton, when heavy metals were added to the samples singly or in combination. It is assumed that this effect is due to the natural selection of more resistant plankton species. (Deal-EIS)
W80-04901

MELIMEX, AN EXPERIMENTAL HEAVY METAL POLLUTION STUDY: OLIGOCHAETES AND CHIRONOMID LARVAE IN HEAVY METAL LOADED AND CONTROL LIMNO-CORRALS,
Conservation de la faune, Lausanne (Switzerland).
C. Lang, and B. Lang-Dobler.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 271-276, 1979. 1 Fig, 2 Tab, 14 Ref.

Descriptors: *Tubificids, *Diptera, *Toxicity, *Heavy metals, Dissolved oxygen, Water chemistry, Sediment-water interfaces, Benthic fauna, Primary productivity, Animal populations, Growth rates, Reproduction, Inhibition.

In two limno-corrals loaded with heavy metals the density of tubificid worms and chironomid larvae was higher than in the control. The better oxygen conditions observed in the heavy metal loaded corrals might explain this discrepancy. The higher oxygen concentration at the sediment-water interface was due to lower organic sedimentation, a consequence of the primary production reduced by heavy metals. In all limno-corrals, the tubificid populations consisted of Tubifex tubifex. The size structure of tubificid populations in the heavy metal loaded corrals indicated a delayed reproduction compared to the control. (Deal-EIS)
W80-04902

SMYRNA, DELAWARE SOLVES A WATER PROBLEM,
Delaware Div. of Public Health, Dover. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W80-04923

OFFSHORE SITING OF NUCLEAR POWER PLANTS,
Illinois Univ. at Urbana-Champaign.
J. W. Kindt.
Ocean Development and International Law Journal, Vol 8, No 1, p 57-103, 1980.

Descriptors: *Energy, *Nuclear powerplants, *Offshore platforms, *Water pollution sources, *Resources development, Jurisdiction, Legislation, International law, Environmental effects, Baseline studies, Floating, *Outer Continental Shelf, *Energy sources, Environmental impact, Law of the Sea, Site selection, *Floating Nuclear Plants(FNPs).

Of the newly suggested energy sources, nuclear power has the most immediate potential for solving predicted energy shortages in the U.S. during the next two decades. Nuclear power plants require approximately 500 acres of ground and a million gallons of cooling water per minute, but there are few remaining land sites in the U.S. which meet these requirements. One solution is to build floating nuclear plants (FNPs) and site them in the ecologically sensitive oceans. The environmental impacts of constructing and operating FNPs appear to be large; however, the domestic legislation of the U.S. can adequately regulate the problems associated with thermal discharge, perimeter contamination, and the risk of major accidents. On the international level, the U.S. needs to recognize the environmental and jurisdictional issues involving FNPs and then avoid potential FNP problems in the current law of the sea negotiations. (Sinha-OEIS)
W80-04942

DEEP WELL INJECTION FOR FLORIDA EFFLUENT.
World Water, Vol 3, No 1, p 22-23, January, 1980.

Descriptors: *Injection wells, *Waste disposal wells, *Sewage disposal, *Florida, Deep wells, Confined aquifers, Saline waters, Sewage effluent.

Deep well injection of sewage effluent is a viable alternative to deep-sea disposal for the Miami, Florida area if there are adequate safeguards to protect the Biscayne aquifer. The Floridan aquifer, even though saline with chloride counts ranging from 600 mg/l to 800 mg/l, also requires protection since it would be a potential source of drinking water if it were desalinated. The injection zone, a highly saline and permeable cavernous dolomite, is separated from the Floridan aquifer by 1000 feet of impermeable, dense carbonates. The effluent ultimately migrates to the Straits of Florida. When completed each of eight 24-inch injection wells will handle 10,000 gpm of effluent treated to 95% removal. It is claimed that deep-well disposal represents 10% of the operating cost and 1% of the maintenance cost for conventional tertiary treatment and deep-sea outfall facilities without the risk of beach pollution. (Purdin-NWWA)
W80-04984

INTERNATIONAL CONTROL OF DUMPING AT SEA,
For primary bibliographic entry see Field 6E.
W80-04993

HIGH FREQUENCY TEMPERATURE FLUCTUATIONS IN A POWER-PLANT THERMAL PLUME,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
T. Green, and S. Roffler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-184062, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center, University of Wisconsin Technical Completion Report WIS WRC 80-06, 1980. 59 p, 22 Fig, 1 Tab, 25 Ref, Append. OWRT B-089-WIS(1), 14-31-0001-4141.

Descriptors: *Thermal powerplants, Powerplants, Water temperature, *Thermal pollution, Water cooling, Heated water, Thermocline, *Point Beach(Wis), Instrumentation, *Water temperature fluctuations, Wisconsin, *Lake Michigan, *Thermal plume, Aerial photography, Infrared radiation, Sampling, Measurement, Laboratory tests, Path of pollutants.

High-frequency temperature variations were measured at seven depths, from the water surface to three meters, at a point 130 meters from the cooling-water outfall of a power plant on Lake Michigan. The data are analyzed using spectra, correlation functions, and probability distributions. The sharp thermal fronts observed in the data are related to the surface thermal fronts seen using airborne infrared scanning, and to laboratory studies of instabilities in mixing layers between uniformly flowing and quiescent fluids.
W80-05009

AGRICULTURAL LAND USE: EFFECTS ON THE CHEMICAL QUALITY OF RUNOFF,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
M. D. Smolen, and V. O. Shanholtz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-183163, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University. Bulletin 125, April 1980. 82 p, 24 Fig, 12 Tab, 18 Ref, Append. OWRT A-058-VA(3).

Descriptors: *Agriculture, *Agricultural runoff, Effects, *Water quality, *Nitrogen, *Phosphorus, Agricultural watersheds, Streamflow, Monitoring, Water analysis, Chemical analysis, Path of pollutants, Baseline studies, Uncultivated watershed, Rainwater quality, *Background water quality.

This research focused on changes in runoff quality when land is put under cultivation. The data will be used in later phases of research to evaluate chemical transport models. The 3 study watersheds, located in Virginia's southern Piedmont, had not been under cultivation for 30 years. During the research, 2 of the watersheds were put into agricultural production while the third was left uncultivated and used as a control. A grab sampling program was maintained on 2 watersheds for the full 5-year study period. Continuous streamflow gaging was maintained for the last 4 years. During the final 3 years, sampling and flow gaging were also maintained on a third watershed. Samples were analyzed for nitrate, ammonium, and total Kjeldahl nitrogen, orthophosphate and total phosphorus, bicarbonate alkalinity, pH, and specific conductance. Clear differences in streamflow characteristics were noted between the treated and the control watersheds. More surface runoff was observed in the treated watersheds than in the control, suggesting that increased surface runoff may have resulted from the cropping activity. All 3 watersheds exceeded the phosphorus criterion proposed by EPA, and a two-to-threefold increase in total phosphorus concentration was attributed to agricultural land use without employment of conservation practices. A twofold increase in total nitrogen concentration also was noted. Soluble inorganic nitrogen was present at a low concentration in the control watershed, but accounted for 20-30 percent of all nitrate nitrogen exported from the treated watersheds. The presence of nitrate nitrogen in the agricultural watersheds was the characteristic most attributable to agricultural activity.
W80-05012

POPULATION DYNAMICS AND TROPHIC RELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, P. J. Gould, and G. A. Sanger.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 7-20, October 1979. 22 Ref. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Birds, *Trophic levels, *Biology, *Habitats, Resources development, Water pollution sources, Environmental effects, Baseline studies, Alaska, *Outer Continental Shelf, Gulf of Alaska, Population dynamics, Petroleum development.

During 1978, studies of the breeding biology of seabirds were conducted at three locations in the Gulf of Alaska (Middleton Island, Sitkalidak Strait, and Chiniak Bay), and one location in Cook Inlet (Chisik Island). Studies on the trophic relationships of seabirds were conducted in the Kodiak area, primarily in Izhut and Kiliuda Bays, during the summer of 1978, and in Kachemak Bay during the winter of 1977-1978. The feeding habits of birds directly pertinent to breeding biology were studied at Sitkalidak, Chisik and Middleton. The selection of study sites was based on several factors, including their location in relation to OCS lease areas, the diversity of habitats, the species of seabirds present, the information available for each site, and the accessibility of each site. (Sinha-OEIS)
W80-05042

THE BREEDING BIOLOGY OF MARINE BIRDS ASSOCIATED WITH CHINIAK BAY, KODIAK ISLAND, 1975-1978,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
D. R. Nysewander, and D. B. Barbour.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 21-106, October 1979. 27 Fig, 19 Tab, 19 Ref, 3 Append, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-01-5-022-3538.

Descriptors: *Birds, *Breeding, *Ecology, Baseline studies, Environmental effects, Water pollution, Waterfowl, Alaska, Resources development, *Outer Continental Shelf, Petroleum development, Trophic relationships, Kodiak(AK).

Intensive studies of the breeding biology of marine birds were conducted at Chiniak Bay, Kodiak Island, in 1978 for the second consecutive year. The rate and annual variation of reproductive success was evaluated for black-legged kittiwake (Rissa tridactyla), tufted puffin (Lunda cirrhata), glaucous-winged gull (Larus glaucescens), mew

gull (Larus canus), pelagic cormorant (Phalacrocorax pelagicus), and red-faced cormorant (Phalacrocorax urile). Breeding phenologies were essentially the same in 1977 and 1978 for all species except pelagic cormorants. Productivity decreased in 1978 for all the major study species except tufted puffin. (Sinha-OEIS)
W80-05043

BREEDING BIOLOGY AND FEEDING HABITS OF SEABIRDS OF SITKALIDAK STRAIT,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
P. A. Baird, and M. A. Hatch.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 107-186, October 1979. 28 Fig, 21 Tab, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder. Colorado. NOAA-01-5-022-2538.

Descriptors: *Birds, *Breeding, *Food habits, Environmental effects, Baseline studies, Resources development, Water pollution effects, Alaska, Oil spills, Drilling, Leases, *Outer Continental Shelf, Petroleum development, Gulf of Alaska, Sitkalidak Strait.

The purpose of the OCSEAP studies was to define the role of seabirds in the Alaskan marine environment and to identify and evaluate potential impacts to the seabirds from the development of the petroleum reserves on the Alaska Outer Continental Shelf. Sitkalidak Strait with its important colonies on Cathedral Island and the adjacent Boulder Bay was identified as a key site to study. Reproductive success of seabirds is not constant from year to year but varies perhaps in accordance with fluctuations in the ecosystem. It is believed that one of the variables in the ecosystem which may influence reproductive success is food availability. Tufted puffins and arctic and Aleutian terns seemed to be most sensitive to human disturbance. Disturbance of the habitat for Arctic and Aleutian terns combined with egging produced very little reproductive output in the colony where this disturbance occurred. Presence of humans and their pets and any major habitat disturbance or destruction at the time before egg laying, and during the egg and chick stages tend to be detrimental to the productivity of the seabirds. (Sinha-OEIS)
W80-05044

REPRODUCTIVE ECOLOGY OF SEABIRDS AT MIDDLETON ISLAND, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
S. A. Hatch, T. W. Pearson, and P. J. Gould.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 233-308, October 1979. 24 Fig, 15 Tab, 23 Ref, Append. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program. Boulder, Colorado. NOAA-01-5-022-2538.

Descriptors: *Birds, *Breeding, *Food habits, *Ecology, Baseline studies, Environmental effects, Water pollution, Resources development, Oil pollution, Reproduction, Alaska, *Outer Continental Shelf, Gulf of Alaska, Petroleum development, Middleton Island.

Studies of population, breeding phenology, productivity, and food habits of seabirds were conducted on Middleton Island from 22 April to 18 August 1978. Middleton Island lies about 50 miles southeast of Montague Island and 70 miles from the Alaskan mainland. The island harbors the largest colonies of several species of seabirds in the north-central Gulf of Alaska. It is situated almost directly in the path of the main Alaska Current and directly downstream from potential oil drilling or pumping operations. For these reasons, Middleton Island is deemed to be a site of key importance for baseline environmental study in the region. Particular emphasis was placed on the breeding phenology of seven species, on the productivity of black-legged kittiwakes and pelagic cormorants, and on the foods brought to nestling kittiwakes, rhinoceros auklets and tufted puffins. On the whole, breeding phenology of seabirds at Middleton Island was extraordinarily early and protracted relative to other colonies in the Gulf of Alaska. (Sinha-OEIS)
W80-05046

THE WINTER FEEDING HABITS OF SELECTED SPECIES OF MARINE BIRDS IN KACHEMAK BAY, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Ecosystems.
G. A. Sanger, R. D. Jones, Jr., and D. W. Wiswar.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 309-347, October 1979. 9 Fig, 8 Tab, 13 Ref, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-01-5-022-2538.

Descriptors: *Birds, *Food habits, *Winter, *Ecology, Baseline studies, Water resources, Resources development, Environmental effects, Food webs, Water pollution, Alaska, *Outer Continental Shelf, Cook Inlet, Trophic relationships, Petroleum development, Kachemak Bay.

From November 1977 to April 1978, marine birds were studied on Kachemak Bay, Alaska to determine their feeding habits and trophic relationships. Kachemak Bay, located at the southwest end of the Kenai Peninsula, Alaska, is a major geographic feature of lower Cook Inlet. It has long been recognized for its high biological productivity. Studies concentrated on oldsquaw, white-winged scoters, common murres and marbled murrelets. The birds ate 74 prey species in 11 major taxonomic groups. The birds in Kachemak Bay in winter appear to be largely dependent on a food web which has a detrital base. Because changes in distribution or abundance of food may be critical to survival of birds, changes in the structure of their food web(s) caused by development of petroleum resources may have major significance. This study, be determining types and importance of prey, will improve predictions of the consequences of environmental changes from petroleum activities. (Sinha-OEIS)
W80-05047

NEARSHORE FEEDING ECOLOGY OF MARINE BIRDS IN THE KODIAK AREA, 1978,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5C.
W80-05048

POPULATION DYNAMICS AND TROPHIC RELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA AND SOUTHERN BERING SEA. PART 11: NOTES ON THE WINTER SEABIRDS OF CHINIAK BAY, KODIAK ISLAND, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
M. Dick.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 492-516, October 1979. 3 Fig, 3 Tab, 11 Ref, Addendum, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Birds, *Ecology, *Seasons, *Winter, *Data collections, Oil spills, Water pollution effects, Baseline studies, Environmental effects, Hazards, Summer, Alaska, Resources development, *Outer Continental Shelf, Trophic relationships, Population dynamics, Kodiak Island.

An annotated list of seabirds observed in Chiniak Bay during the winter of 1976-77 is presented. Included are observations and records by local observers, mostly fishermen. Outer Continental Shelf (OCS) studies to date in Alaska have not adequately assessed inshore winter bird distribution, abundance and trophic relationships. It would seem that the danger of an oil disaster inshore is greater in winter than in summer. If a disaster were to occur in winter, cleanup operations would likely be more difficult, and volatile components would not evaporate as fast. The effects of a winter oil spill are less easily assessed, because the bird populations involved are mostly not local; they come from many areas. The damage would not only affect the spill area, but also breeding grounds northward, westward, and in the interior of Alaska. The effects of a winter spill, however, might not be as lasting as a summer spill which involves whole colonies of breeding birds. It is recommended that more field crews be launched for safe but intensive winter field work in certain areas such as Kokiak, perhaps coordinated with boat surveys for ground truth. (Sinha-OEIS)
W80-05050

BACTERIA: WHAT'S IN THE WATER.,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8A.
W80-05064

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM GULF OF ALASKA, BERING AND BEAUFORT SEAS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
I. R. Kaplan, M. I. Venkatesan, S. Brenner, E. Rugh, and J. Bonilla.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol V, Receptors--Microbiology, Contaminant Baselines, p 597-659, October 1979. 16 Fig, 19 Tab, 45 Ref. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Organic matter, *Sediments, *Baseline studies, *Monitoring, *Path of pollutants, Oil pollution, Resources development, Water pollution effects, Environmental effects, Alaska, *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Beaufort Sea, Norton Sound, Hydrocarbons, Biogenic hydrocarbons, Anthropogenic hydrocarbons.

Sediments were collected from the proposed lease areas of Beaufort Sea, Norton Sound, Kodiak Shelf and Cook Inlet during 1976-1978 and analyzed for total carbon, organic carbon, aliphatic and aromatic hydrocarbon contents. The objectives of the investigation are: (1) to establish the baseline hydrocarbon levels of sediment samples in the area, (2) to characterize the distribution and nature of these hydrocarbons, (3) to assess the possible source of the hydrocarbons in surface sediments, whether biogenic or anthropogenic, and (4) to understand the probably pathways of hydrocarbon transport in each of the areas in case of an oil spill. The baseline studies indicate that the sediment in the study areas is generally unpolluted. The characteristics of n-alkane hydrocarbons are typical of a mixture of marine and terrestrial components; with Norton Sound sediments containing the highest and Kodiak Shelf sediments, the lowest levels of terrigenous input. The distribution of polycyclic aromatic hydrocarbons is complex and shows a pyrolysis source in all the study areas. In addition, the presence of fossil arenes is indicated in Beaufort Sea sediments. (Sinha-OEIS)
W80-05065

NATURAL DISTRIBUTION AND ENVIRONMENTAL BACKGROUND OF TRACE HEAVY METALS IN ALASKAN SHELF AND ESTUARINE AREAS,
Battelle-Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5C.
W80-05066

POLLUTION: INTERNATIONAL CONVENTIONS, FEDERAL AND STATE LEGISLATION,

For primary bibliographic entry see Field 6E.
W80-05072

FEDERAL WATER POLLUTION CONTROL ACT - THE FEDERAL GOVERNMENT'S EXCLUSIVE REMEDY FOR RECOUPMENT OF OIL SPILL CLEANUP COSTS,
For primary bibliographic entry see Field 6E.
W80-05073

LAND USE CONTROLS IN COASTAL AREAS,
Kentucky Univ., Lexington
For primary bibliographic entry see Field 6E.
W80-05075

5C. Effects Of Pollution

NUTRIENT INTERACTIONS AND ALGAL QUALITY IN CAYUGA LAKE,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Ecology and Systematics Section.
J. P. Barlow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180912, Price codes: A03 in paper copy, A01 in microfiche. Project Technical Completion Report to the Office of Water Research and Technology, April 1980. 33 p, 6 Fig, 3 Tab, 40 Ref. OWRT C-6054(No 5206)(1), 14-31-0001-5206.

Descriptors: Eutrophication, Algae, Diatoms, *Phosphorus, *Silicates, *Phytoplankton, *Growth rates, Lakes, New York, *Cayuga(NY).

Mixed phytoplankton from Cayuga Lake, N.Y. were subjected to perturbations of Si and P in continuous flow experiments. Diatom growth rates and cell quotas in late summer (July-August) were used to derive parameters for Droop's empirical growth equation. Using these parameters with Droop's relations it was possible to identify periods when diatom growth was controlled by P or Si, and to relate rate of growth to cell quotas during late summer. These same parameters did not, however, serve to relate observed growth rate to cell quotas at lower temperatures of experiments run in spring and early summer (May-June). It is shown that it would require as much as 2-5X changes in size of these parameters to relate growth to cell quotas at these lower temperatures, and that it would also require equivalent increases in cell quotas to maintain the same rate of nutrient controlled growth at the lower temperatures. Estimates of cell quotas of the natural lake community suggest that seasonal changes in diatom abundance is probably not controlled by Si-depletion, and that in summer diatom growth is controlled by P.
W80-04801

WASTEWATER RECYCLING: DEVELOPMENT OF PLANT DISEASE IN AN OLD FIELD ECOSYSTEM,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 3C.
W80-04805

AN AVOIDANCE RESPONSE BIOASSAY FOR AQUATIC POLLUTANTS,
Kentucky Water Resources Research Inst., Lexington.
J. A. Black, and W. J. Birge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180490, Price codes: A03 in paper copy, A01 in microfiche. Research Report No 123, 1980. 40 p, 7 Fig, 3 Tab, 38 Ref. OWRT A-077-KY(1), 14-34-0001-8019(FY-78), 14-34-0001-9019(FY-79).

Descriptors: *Heavy metals, *Avoidance response, *Behavior, *Fish, Amphibia, Water quality, *Bioassay, Pollutants, Toxicity, *Attraction, *Juvenille fish, Embryo-larval tests.

Avoidance response bioassays were conducted with eight aquatic contaminants, including cadmium, copper, mercury, zinc, chloroform, dioctylphthalate (DOP), trisodium nitrilotriacetic acid (NAT), and phenol. Tests were performed in a dual-channel fluviarium system, and the toxicant injection procedure used provided good regulation of exposure concentrations. Juvenille stages of largemouth bass (Micropterus salmodes), bluegill, sunfish (Lepomis macrochirus), and rainbow trout (Salmo gairdneri), and tadpoles of the American toad (Bufo amaricanus) proved to be suitable animals for evaluating avoidance or attraction responses. The trout was the most sensitive species tested. Avoidance was significant in tests with cadmium, phenol, and zinc, and significant attraction resulted from exposures to chloroform, DOP, and mercury. Animals generally avoided lower concentrations of copper but were attracted to higher exposure levels. NTA produced variable responses. In tests with trout, threshold concentrations for avoidance or attraction were estimated to fall at 0.0002 mg/l mercury, 0.047 mg/l zinc, 0.052 mg/l cadmium, 0.074 mg/l copper, 11.9 mg/l chloroform, and 56.6 mg/l NTA. The threshold for phenol, determined using bluegill, was 39.0 mg/l. Results from fish embryo-larval toxicity tests were used to gauge sensitivity of the avoidance response bioassay. Toxicant concentrations which produced embryo-larval lethality or teratogenesis at frequencies of 10% (LC10) and 1% (LC1) were compared. (Huffsey-Kentucky)
W80-04806

MICRO-ORGANIC COMPOUNDS IN THE WATER ENVIRONMENT AND THEIR IMPACT ON THE QUALITY OF POTABLE WATER SUPPLIES,
Water Research Commission, Pretoria (South Africa).
G. J. Stander.
Water S. A., Vol 6, No 1, p 1-14, January 1980. 6 Fig, 19 Tab, 25 Ref.

Descriptors: *Organoleptic properties, *Organic compounds, *Water quality, *Water pollution sources, *Potable water, Odor, Taste, Water properties, Chemical analysis, Pollutant identification, Toxicity, Water pollution effects, Water chemistry, Chlorination, Water purification.

An evaluation of the reported literature on micro-organics in water was used to develop a plan for the optimum utilization of South Africa's limited water resources. Micro-organic compounds in the water environment came from return flows from waste water treatment facilities, urban and agricultural runoff, and atmospheric precipitation. Recently developed improved analytical techniques have resulted in the identification of more than one thousand organic compounds at very low concentrations. These compounds have been classified into 22 groups that are listed with the number of compounds in each group. Frequencies of detection in drinking water and their highest concentrations are also given. Toxicity ratings are given for the approximately 60 compounds reported in drinking water by the American Waterworks Association. Despite much alarm there is very limited evidence that micro-organics in drinking water are connected to health problems. Epidemiological studies are needed to further evaluate the significance of micro-organics in water quality. Tastes and odors in drinking water caused by organic compounds in micro-concentrations especially from chlorination are discussed. Overall there is agreement that the current conventional water purification processes can effectively provide healthy safe drinking water, however, South Africa should adopt a plan of prevention rather than cure to ensure the health safety of public water supply systems. (Seigler-IPA)
W80-04883

HEALTH CONSIDERATIONS IN THE PREPARATION OF DRINKING WATER FROM THE RIVER RHINE,
Keuringsinstituut voor Waterleidingartikelen, Rijswijk (Netherlands).
C. L. M. Poels,.
Water S. A., Vol 6, No 1, p 15-20, January 1980. 2 Fig, 4 Tab, 9 Ref.

Descriptors: *Rhine River, *Potable water, *Rainbow trout, *Water quality, *Chromosomes, Cytological studies, Toxicity, Public health, Water pollution, Water purification, Aquatic bacteria, Organic compounds, Minnows, Fish eggs, Fish reproduction.

The toxicity of Rhine River water to rainbow trout was studied as part of an assessment of the safety of drinking water prepared from river water. Four experiments were conducted: (1) determination of the chronic toxic quality of Rhine water and its effects on rainbow trout; (2) determination of the effects of Rhine water on egg and juvenile development of rainbow trout; (3) introduction of cytogenetic effects of Rhine water in fish; and (4) introduction of mutations in bacteria by Rhine water extracts. A brief general description of experimental design is given for each experiment along with a discussion of results. From the overall results it is concluded that: (1) Rhine water is chronically toxic to rainbow trout; (2) rainbow trout are unable to complete normal life cycles in Rhine water due to high egg mortality rates; (3) chromosome breaks occur in the gills of the eastern mudminnow when exposed to Rhine water; and (4) mutations are induced in bacteria exposed to the fraction of armoatic hydrocarbons found in Rhine water. From these results it is concluded that chronic exposure to Rhine water can be harmful to water organisms. While these conclusions are based on experiments with fish, and little is known about the relationship of fish susceptibility and human susceptibility, the use of Rhine water in the preparation of drinking water should receive further careful research. (Seigler-IPA)
W80-04884

STUDY OF THE BENTHIC POPULATIONS OF SOFT SUBSTRATES OFF THE OUTFALL OF THE MAIN SEWER OF MARSEILLE. I. GENERAL DATA ON THE ENVIRONMENT AND POPULATIONS (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
J. C. Romano.
Tethys, Vol 9, No 2, p 113-121, 1979. 6 Fig, 10 Tab, 7 Ref. (English Summary).

Descriptors: *Sewage effluents, *Toxicity, *Aquatic populations, Benthic fauna, Outlets, Sewage disposal, Dissolved oxygen, Domestic wastes, Municipal wastes, Water chemistry, Chlorination, Dominant organisms, Marseille, Mediterranean, *Capitella, *Nereis, *Scolelepis, France.

Almost all the waste water of Marseilles discharge into the sea at the 'calanque de Cortiou'. The influence of the pollution on benthic populations of soft bottom shows the existence of concentric areas in front of the outlet of the sewage. Seven stations were studied every month for one year. In this paper, some characters of populations are described using a yearly mean for each station. Correlations are established between nature of populations and natural conditions. A microrepartition of these populations is pointed out. (Deal-EIS)
W80-04888

CADMIUM, ZINC AND COPPER ACCUMULATION IN LIMPETS (PATELLA VULGATA) FROM THE BRISTOL CHANNEL WITH SPECIAL REFERENCE TO METALLOTHIONEINS,
Liege Univ. (Belgium). Lab. d'Oceanography.
For primary bibliographic entry see Field 5B.
W80-04893

CONCENTRATION AND DISTRIBUTION OF URANIUM IN MYTILUS EDULIS AND ASSOCIATED MATERIALS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5B.
W80-04895

ACCUMULATION AND BIOLOGICAL EFFECTS OF CADMIUM IN RAINBOW TROUT,
Tokai Regional Fisheries Research Lab, Yokosuka (Japan). Arasaki Marine Biological Station.

For primary bibliographic entry see Field 5B.
W80-04896

INFLUENCE OF COPPER AND ZINC IN FOOD SUBSTANCE ON THE ACCUMULATION OF CULTURED OYSTERS (IN JAPANESE),
Iwate Prefectural Office (Japan). Forestry and Fishery Div.
For primary bibliographic entry see Field 5B.
W80-04897

DEGREE OF DISPERSION OF THE ZACO TEMMINCKI SCHOOL TO WATER QUALITY IN A STREAMING WATER TROUGH (IN JAPANESE),
Tokyo Univ. of Fisheries (Japan).
M. Inoue, T. Arimoto, and I. Kono.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 45, No 12, p 1485-1490, 1979. 2 Fig, 7 Tab, 5 Ref, (English abstract).

Descriptors: *Fish behavior, *Toxicity, *Water pollution, Bioindicators, Detergents, Schools(Fish), Water quality, Social behavior(Animal), Analytical techniques, Water chemistry, Rheotropism, Bioassay.

In a preliminary observation on the schooling behaviour of three kinds of river fish (Zacco temmincki, Tribolodon hakonensis, and Morco steindachneri), which were composed of three fish each, it was found that the school of Z. temmincki showed the most concentrated schooling behaviour at a certain position in the water trough compared with the other two kinds of fish. Using this behaviour of Z. temmincki, the relation between the degree of dispersion of the school and the water quality was examined and the following results were obtained. The degree of dispersion of the Z. temmincki was obviously affected by the water samples taken from three stations of the Tama river and it was also found to be affected by the difference of water quality caused by the degree of synthetic detergent ABS contained. (Deal-EIS)
W80-04898

MELIMEX, AN EXPERIMENTAL HEAVY METAL POLLUTION STUDY: OLIGOCHAETES AND CHIRONOMID LARVAE IN HEAVY METAL LOADED AND CONTROL LIMNO-CORRALS,
Conservation de la faune, Lausanne (Switzerland).
For primary bibliographic entry see Field 5B.
W80-04902

MELIMEX, AN EXPERIMENTAL HEAVY METAL POLLUTION STUDY: EFFECTS OF INCREASED HEAVY METAL LOAD ON CRUSTACEA PLANKTON,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
J. Urech.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 247-260, 1979. 5 Fig, 7 Tab, 31 Ref.

Descriptors: *Heavy metals, *Crustaceans, *Zooplankton, *Toxicity, Growth rates, Inhibition, Growth stages, Mercury, Copper, Cadmium, Zinc, Lead, Lakes, Mode of action, Mortality, Zooplankton fecundity.

The crustacea plankton of three artificial model lakes in Lake Baldegg was observed during 15 months. Two were loaded continuously with low concentrations of five heavy metals (Hg, Cu, Cd, Zn, Pb). We attempted to explain the significant lower abundances of the loaded limno-corrals. The results suggest that the decrease was not, or only partially, caused by the lower food supply in the loaded limno-corrals, but directly by the heavy metals. Accompanying laboratory tests show significantly increased egg-development-times for two species of those animals from the loaded limno-corrals. It cannot be determined if increased mortality of particular animal stages was caused by heavy metals. (Deal-EIS)
W80-04903

MELIMEX, AN EXPERIMENTAL HEAVY METAL POLLUTION STUDY: EFFECTS OF INCREASED HEAVY METAL LOADS ON PHYTOPLANKTON COMMUNITIES,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
R. Gachter, and A. Mares.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 228-246, 1979. 10 Fig, 3 Tab, 40 Ref.

Descriptors: *Heavy metals, *Toxicity, *Phytoplankton, On-site-investigation, Mercury, Copper, Cadmium, Zinc, Lead, Biomass, Photosynthesis, Inhibition, Adaptation, Zooplankton, Seasonal, Dominant organisms, Amino acids, Biochemistry, *Species diversity.

Long-term impacts of increased metal loading (Hg, Cu, Cd, Zn and Pb) on phytoplankton communities of large limno-corrals (diameter 12 m. depth 10 m) were studied. Increased metal concentrations initially lowered phytoplankton biomass, as well as species number and photosynthetic activity of phytoplankton. They caused changes in metal speciation and shifts in phytoplankton community structure, favoring less susceptible species. Although adaptation was not sufficient to completely prevent the metal-induced depression of photosynthesis, due to depressed zooplankton grazing, at the end of the experiment even higher phytoplankton densities were observed in the metal-loaded corrals than in the control. (Deal-EIS)
W80-04904

EFFECTS OF INGESTED CRUDE OIL ON BLACK GUILLEMOTS: A COMBINED FIELD AND LABORATORY STUDY,
Canadian Wildlife Service, Ottawa (Ontario). Wildlife Toxicology Div.
D. B. Peakall, D. Hallett, D. S. Miller, R. G. Butler, and W. B. Kinter.
Ambio, Vol 9, No 1, p 28-30, 1980. 4 Fig, 3 Tab, 18 Ref.

Descriptors: *Oil, *Toxicity, *Water birds, Analytical techniques, Methodology, On-site data collections, Oil pollution, Growth rates, Growth stages, Mode of action, Weight, Path of pollutants, *Tissue analysis, *Black guillemot, *Cepphus.

The experiment presented here was performed using a new experimental design for assessing pollutant toxicity. The technique permits carefully controlled experimentation on seabirds living normally in their chosen habitat, and is based on the observation that nestling black guillemots remain in their nest cavity for as long as 40 days after hatching during which period the adults continue to feed their young despite occasional disturbance by investigators handling the young for dosing and/or sampling. Toxicity studies thus made on individual nestlings involve minimal disruption of their normal way of life. At any point in the experiment, live birds or tissue samples can be transported to a laboratory for detailed physiological, biochemical and histological studies. The technique was then employed using a single dose of weathered crude oil. The data on the effect of oil on body weight suggest that a single dose of weathered crude oil could cause serious effects. Black guillemots which were dosed when they were roughly two weeks of age (about 125 g body weight) exhibited significantly smaller gains in body weight over the next three weeks than corresponding controls. At about five weeks of age (within one week of fledging), these experimentals were 20 percent lighter than controls. Since many oceanic bird species disperse into the open sea (alcids) or undertake long migrations (petrels) immediately after fledging one would expect that these lighter birds might be less able to survive this major period of stress. (Deal-EIS)
W80-04905

EFFECTS ON FISH EXPOSED TO EFFLUENT FROM A TITANIUM DIOXIDE INDUSTRY AND TESTED WITH ROTATORY-FLOW TECHNIQUE,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
For primary bibliographic entry see Field 5A.
W80-04906

INFLUENCE OF SUMMER DROUGHT ON THE POPULATION OF AQUATIC INSECTS IN A TEMPORARY SALT-MARSH IN THE CRAU DISTRICT (MOUTH OF THE RIVER RHONE) (IN FRENCH),
Aix-Marseille-I Univ. (France). Lab. for Animal Biology-Ecology.
A. Thiery.
Annales Limnologie, Vol 15, No 2, p 181-191, 1979. 3 Fig, 11 Ref, (English Summary).

Descriptors: *Growth stages, *Droughts, *Insects, *Adaptation, Aquatic insects, Seasonal, Summer, Life cycles, Larval growth stage, Salt marshes, Dominant organisms, *Berosus, River Rhone, France.

In a temporary salt-marsh in Crau, the only insects adapted to the summer drought are species in the Hydrophilidae (Coleoptera), especially the dominant species Berosus guttalis. The life cycle of this species is described, and it is shown that, at the time of the drought, almost 80% of the larvae are in Stage III which is proved to be essential for pupation. This synchronization of larval development and summer drought ensure that the species has the highest chance of survival. (Deal-EIS)
W80-04907

A STUDY OF PERIPHYTON IN A POLLUTED RIVER (L'AGOUT) I. STRUCTURE AND DEVELOPMENT OF COMMUNITIES ON ARTIFICIAL SUBSTRATA. (IN FRENCH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
J. Capblancq, and M. Cassan.
Annales Limnologie, Vol 15, No 2, p 193-210, 1979. 6 Fig, 1 Tab, 25 Ref. (English Summary).

Descriptors: *Periphyton, *Growth rates, *Metabolism, Biomass, Bioindicator, Water pollution, Benthic flora, Aquatic bacteria, Aquatic algae, Dominant organisms, Biological communities, Sphaerotilus, *Artificial substrates.

Artificial substrata, replaced every 20 days from June to November, have been used to study the production and structure of the community of benthic microphytes in a 50 km-section of a polluted river. The periphyton of this environment, largely dominated by the filamentous bacterium Sphaerotilus natans, is characterised by the poor development of algae and by rapid growth. The spatial and temporal changes in the growth rate of the phototrophic (P) and heterotrophic (H) communities, as well as the biomass ratio (P/H) and specific composition the biocoenosis, are related to the variations in the load of pollutant. The possibilities of utilising such indices for characterising levels of organic pollution are discussed. (See also W80-04909) (Deal-EIS)
W80-04908

A STUDY OF PERIPHYTON IN A POLLUTED RIVER (L'AGOUT) II. METABOLISM AND DYNAMICS OF GROWTH ON ARTIFICIAL SUBSTRATA, (IN FRENCH),
Institutet for Vatten- Och Luftvardsfor skning, Stockholm (Sweden).
J. Capblancq, and M. Cassan.
Annales Limnologie, Vol 15, No 2, p 211-222, 1979. 6 Fig, 21 Ref. (English Summary).

Descriptors: *Periphyton, *Growth rates, *Metabolism, Biomass, Bioindicators, Monitoring, Water pollution, Oxygen demand, Benthic flora, Water purification, Carbon radioisotopes, Tracers, *Artificial substrates, *Glucose.

Weekly samples from artificial substrata submerged at a point in a polluted river were used to follow the growth of periphyton over periods of 28 days. The biomass is chiefly filamentous bacteria and the changes in biomass show that the specific growth rate of benthic microphytes decreases as a function of the immersion period of the

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substrata. It is the same for the metabolic activity of the periphyton, measured in the laboratory by the rate of oxygen consumption and by the assimilation kinetics of organic substances (14C-glucose). The contribution of benthic microphytes to the purification process and the results provided by artificial substrata are discussed. (See also W80-04908) (Deal-EIS)
W80-04909

THE EFFECT OF LEAD, CADMIUM, AND MERCURY ON THE INCREASE IN LENGTH OF FIVE INTERTIDAL FUCALES,
Trondheim Univ. (Norway). Museum.
T. Stromgren.
Journal of Experimental Marine Biology and Ecology, Vol 43, p 107-119, 1980. 6 Fig, 1 Tab, 31 Ref.

Descriptors: *Growth rates, *Phaeophyta, *Cadmium, *Lead, *Mercury, Heavy metals, Marine algae, Plant growth, Seasonal, Toxicity, Mode of action, Peluctia, Fucus, Ascophyllum, Growth enhancement.

The increase in length of Pelvetia canaliculata, Fucus spiralis, F. vesiculosus, F. serratus, and Ascophyllum nodosum was measured in various concentrations of lead, cadmium, and mercury during a period of 9-10 days. Concentration ranges of the three metals were 45-2600 microg/l, 1.5-1040 microg/l, and 0.9 1250 microg/l, respectively. Significant reductions of growth rate compared with the controls were observed at $>$ 810 microg/l of lead, $>$ 450 microg/l of cadmium, and $>$ 10 microg/l of mercury, and significant regressions of growth reduction on log concentration were indicated. Growth was significantly enhanced in Pelvetia canaliculata and Ascophyllum nodosum when exposed to cadmium, and in this case there was a significant regression of growth increase on log concentration. The growth of Pelvetia canaliculata was also enhanced at all concentrations of lead. (Deal-EIS)
W80-04910

INFLUENCE OF COPPER SULPHATE ON THE STRUCTURE OF THE NET OF LARVAE OF HYDROPSYCHE (INSECTA, TRICHOPTERA), (IN FRENCH),
Baden-Wuerttemberg Landesanstalt fuer Umweltschutz (Germany, F.R.).
W. K. Besch, I. Schreiber, and E. Magnin.
Annales Limnologie, Vol 15, No 2, p 123-138, 1979. 17 Fig, 11 Ref. (English Summary).

Descriptors: *Copper sulfate, *Toxicity, *Insects, Animal behavior, Animal physiology, Mode of action, Copper compounds, Larval growth stage, Bioindicator, Bioassay, Methodology, Aquatic insects, *Hydropsyche.

Copper sulphate with an initial concentration as low as 125 microg Cu/l in hard water adversely affects the capacity of the larvae of Hydropsyche to spin nets. The irregularity that is first apparent is the high number of thread-interruptions. At higher concentration, the number of meshes per net decreases. A typical anomaly of the toxic action of copper is the deposition of threads as cotton-like harks instead of net tissues. The symmetry and regularity of the meshes in the catching area is only slightly affected by copper. This contrasts strikingly with the effects of a carbamate insecticide studied earlier. The primary site of the action of copper seems to be the silk gland and not the nervous system as is the case with the above pesticide. The findings in the laboratory confirm those made in the field. Concentrations which severly impair net construction are prohibitive for occurrence in nature. The Hydropsyche-test requires only short test-times and simple equipment and yet gives information on long term effects. (Deal-EIS)
W80-04911

THE DIFFERENT ADAPTABILITY OF FISH TO EUTROPHICATION, (IN GERMAN),
Staatliches Inst. fuer Seenforschung und Fischereiwesen, Langenargen (Germany, F.R.).
J. Hartmann.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 374-382, 1979. 3 Fig, 2 Tab, 19 Ref. (English abstract).

Descriptors: *Eutrophication, *Lakes, *Fish populations, Yield equations, Adaptation, Water pollution, Perches, Dominant organisms, Salmonids, Commercial fish, Fish physiology, European lakes, Yellow perch, Pike, *Coregonus, *Abramis, Tinca.

The succession of yield of 10 fish species or genera in European lakes undergoing cultural eutrophication is described. Non-pelagic species often display no yield increase, whereas potential pelagic ones do for a time. Coregonus spp. and Perca fluviatilis exhibit yield increase and intensified yield fluctuations. A decrease of yield of the combined Coregonus spp. rarely has been observed in lakes with a mean depth more than 50 m. In respect to adaptability to rapid eutrophication, from yield patterns and changed biology three groups of fish are distinguished: (1) preadapted fish, as Stizostedion lucioperca; (2) obviously adapting ones, represented by potential pelagic-planktivorous species as Rutilus rutilus and P. fluviatilis; (3) not obviously adapting ones which include littoral fish as Esox lucius and Tinca tinca. (Deal-EIS)
W80-04912

INFLUENCE OF HYDROCARBONS ON ECOLOGY OF BACTERIA IN AEROBIC LAKE SEDIMENT, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
H. Buhrer.
Schweizerische Zeitschrift fur Hydrologie, Vol 41, No 2, p 315-355, 1979. 12 Fig, 13 Tab, 51 Ref.

Descriptors: *Oil, *Toxicity, *Bacteria, *Bottom sediment, Oil pollution, Lakes, Aerobic bacteria, Chemical analysis, Chlorophyta, Ecosystems, Growth rates, Dominant organisms, Water pollution effects.

Two different hydrocarbon loadings of sediment cores were analyzed 4 times during 21 days. Applied methods were: Direct count, isolation of more than 100 colonies on a diluted plate-count agar and estimation of 42 attributes (282 levels), followed by a single link clustering and calculation of the information basing on attribute level (i.e. negative entropy). Loading of 100 g fuel oil/sq m sediment caused a depletion of germs and information. Full restoration could not be observed. When 10 g fuel/sq m was applied there was no significant effect, but if algae were supplied too, the effect was similar to using 100 g/sq m. An extrapolation of the results gives a tolerance of hydrocarbon loading for Lake Constance or Lake Zug of 10 to 20 times the load present, but effects on fishes or fishfood were not considered. (Deal-EIS)
W80-04913

OIL SPILLS: A PUBLIC OFFICIAL'S HANDBOOK,
State Univ. of New York Coll. at Potsdam. Dept. of Anthropology.
J. T. Omohundro.
Cornell University Extension Publication, Information Bulletin 166, Social Sciences Sea Grant 3, March 1980. 19 p, 21 Ref.

Descriptors: *Oil spills, *Social aspects, Oil pollution, Water pollution treatment, Pollution abatement, *Public officials, Emergency action, Rehabilitation, *Handbook.

This handbook explains the social response to an oil or hazardous substance spill, particularly in water. The reactions of the victims and coastal residents of the impacted area are identified, and actions that may reduce social problems are suggested. The last section, 'Suggestions for Planning and Response,' may be consulted immediately in the event of a spill. An emergency checklist on the back cover addresses specific actions and guides the reader to appropriate sections of this handbook. The quick reference charts 1, 2, and 3 may serve as memory aids to the social context of particular problems. Official should find this handbook useful in preparing for public meetings and news conferences, in conducting personal interviews while reconnoitering or administering in the impacted area, and in handling telephone and written requests for information or help. (NOAA)
W80-04938

OIL SPILLS: A COASTAL RESIDENT'S HANDBOOK,
State Univ. of New York Coll. at Potsdam. Dept. of Anthropology.
J. T. Omohundro.
Cornell University Extension Publication, Information Bulletin 164, Physical Sciences Sea Grant 2, March 1980. 15 p, 5 Ref.

Descriptors: *Oil spills, *New York, *Great Lakes, *Coasts, Water pollution control, Pollution abatement, Water pollution treatment, *Human population, Emergency action, Area residents, *Handbook, Regional response team.

People living on or using the water bodies within and bordering New York State will find this bulletin valuable in case of an oil spill emergency. Knowledge of what can happen and what can be done in case of a spill emergency may save needless confusion, anxiety, and loss or damage. The first half of this bulletin explains what happens in a spill and what official parties will do. The self-help advise in the second half of this bulletin may reduce loss and damage to property owners or sportsmen on Lake Erie, Lake Ontario, the Saint Lawrence Seaway, Lake Champlain, the Hudson River, the Barge Canal System, New York Harbor, Long Island Sound or the Atlantic Ocean. The bulletin should be kept handy as a reference in time of emergency. (NOAA)
W80-04939

FISHING AND NORTH SEA OIL,
Department of Agriculture and Fisheries for Scotland, Edinburgh.
G. P. S. MacArthur.
Scottish Fisheries Bulletin 43, p 27-31, 1976.

Descriptors: *Fishing, *Oil industry, *Water pollution effects, Resources development, Oil pollution, Oil spills, Environmental effects, Outer Continental Shelf, North Sea, Environmental impact, Petroleum development.

Consultations between the fishermen and oil-men who share the North Sea, fall into two broad categories; direct consultations between representatives of fishermen and an individual oil company concerning a specific offshore development; and the broader consultations which take place in the Fisheries and Offshore Oil Consultative Group (FOOCG), on which both industries are represented. Under the auspices of FOOCG a factual study has been made to ascertain as far as possible the effect of North Sea Oil and gas installations on access to fishing grounds. Although a broad assessment of the effect can be made on the basis of a number of assumptions the study disclosed, there are difficulties in attempting to quantify the precise effect. The areas involved are small in relation to fishing patterns, which themselves undergo change for reasons unrelated to offshore developments. As offshore exploration continues and finds already made and finds still to be made are exploited it is all the more important to ensure that these offshore activities interfere with fishing as little as possible. (Sinha-OEIS)
W80-04941

OFFSHORE SITING OF NUCLEAR POWER PLANTS,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 5B.
W80-04942

SEA OTTER DISTRIBUTION AND ABUNDANCE SOUTHERN KODIAK ARCHIPELAGO AND THE SEMIDI ISLANDS,
Alaska Dept. of Fish and Game, Anchorage.
K. Schneider.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investi-

gators for year ending March 1979. Vol I, Receptors--Mammals--Birds, p 169-191, October 1979. 12 Fig, 12 Tab, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. 03-5-022-69.

Descriptors: *Mammals, *Otters, *Oil pollution, *Water pollution effects, Environmental effects, Baseline studies, Ecology, Resources development, Alaska, *Outer Continental Shelf, Kodiak Island, Semidi Islands, Petroleum development.

Sea otters have been sighted throughout the shallow waters southeast of Kodiak Island but established breeding groups occupy only two areas. The largest colony inhabits the waters south of the Trinity Islands and is roughly estimated to number between 400 and 700 sea otters. A second concentration of less than 100 sea otters exists around Chirikof Island. Sea otter densities in these areas are believed to be well below the capacity of the habitat but numbers are increasing. Both colonies are vulnerable to oil spills because of their small size, limited distribution and proximity to proposed OCS lease tracts. Sea otters have been present in the Semidi Islands at least since 1957. The present population is small (30 to 50 animals) and not occupying all available habitat. (Sinha-OEIS)
W80-04946

BELUKHA WHALES IN LOWER COOK INLET,
Alaska Dept. of Fish and Game, Anchorage.
N. Murray.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol I, Receptors--Mammals--Birds, p 192-208, October 1979. 1 Fig, 28 Ref, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. 03-5-022-69.

Descriptors: *Mammals, *Oil pollution, *Water pollution effects, Baseline studies, Ecology, Environmental effects, Resources development, Alaska, *Outer Continental Shelf, Cook Inlet, *Belukha whales.

The Cook Inlet belukha population has been estimated at 300 to 400, and is thought to be resident in the Inlet year-round. Sighting data confirms that belukhas are present in all seasons. Belukhas are seasonally distributed in the different regions of the Inlet. They have been sighted in the Upper Inlet primarily in late spring and summer. Belukhas are seen throughout the year in the central and lower areas, with heaviest use occurring in the central Inlet area. Within the Inlet, numbers appear to fluctuate seasonally, with the greatest number seen in mid to late summer and the fewest in winter. Ice conditions may have a strong correlation with winter abundance. The habitat types used by belukhas appear to fall into four categories: migration routes, feeding grounds, breeding grounds and calving/nusery grounds. Food resources may be the critical element determining the interrelationship of habitat requirements. The habitat requirements vary seasonally and with the age and sex of the whale. The seasonal variations are dynamic and introduce difficulties in determining simple habitat requirements. (Sinha-OEIS)
W80-04947

ECOLOGICAL STUDIES OF BIRDS IN THE NORTHERN BERING SEA: SEABIRDS AT BLUFF, DISTRIBUTION OF BIRDS AT SEA, MOVEMENTS OF BIRDS IN THE BERING STRAIT,
College of the Atlantic, Bar Harbor, ME.
C. Ramsdell, and W. H. Drury.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol I, Receptors--Mammals--Birds, p 600-769, October 1979. 27 Fig, 32 Tab, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. 03-6-022-35208.

Descriptors: *Birds, *Waterfowl, *Shore birds, *Oil pollution, *Water pollution effects, Environmental effects, Baseline studies, Resources development, Alaska, *Outer Continental Shelf, Petroleum development, Bering Sea, Bering Strait.

The goal of this study is to assess the present environmental conditions in the northern Bering Sea and Bering Strait while specific objectives are to determine the breeding areas and seasonal changes in density and distribution of the principle seabird species; and to describe the trophic relations of selected species. Studies were concentrated on two numerous and widespread species, Common Murres and Black-legged Kittiwakes, because they are convenient to study and offer opportunity to compare results with those obtained by others in other parts of these well-studied species' ranges. Some of the most obvious effects of hydrocarbon exploration and transport on birds may include: (1) direct disturbance by the presence of and activities associated with heavy equipment; (2) pollution of the waters by hydrocarbons and other industrial chemicals; (3) direct disturbance by increased human activity associated with development; (4) secondary effects reflecting increased land development for support facilities and transportation corridors; (5) secondary effects reflecting the recreational demands of additional people travelling off regular transportation corridors; (6) effects of increased human activities involving species which are sensitive to disturbance by humans or which attract human hunting or curiosity; (7) effects of human activities that will provide a sibsidy for aggressive species able to take advantage of resources, e.g., food from wastes; and (8) secondary effects of the impact of aggressive species benefitting from human development, on sensitive species vulnerable to competition. (Sinha-OEIS)
W80-04951

SUBLETHAL EFFECTS OF PETROLEUM HYDROCARBONS AND TRACE METALS, INCLUDING BIOTRANSFORMATIONS, AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL, PATHOLOGICAL, AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
D. C. Malins, H. O. Hodgins, N. L. Karrick, and D. D. Weber.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol VI, Effects, p 60-171, October 1979. 22 Fig, 18 Tab, 85 Ref, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. R7120819.

Descriptors: *Oil pollution, *Water pollution effects, *Environmental effects, *Aquatic life, Alaska, Resources development, Pathology, Fish diseases, Vertebrates, Invertebrates, *Outer Continental Shelf, Petroleum development.

The overall objective of this program was to assess potential effects of petroleum and petroleum-related operations on marine organisms indigenous to Alaskan waters. Several principal objectives addressed by this research were: (1) to evaluate the effect of petroleum on sensory systems and behavior of marine species by determining if petroleum in sediment causes flatfish to avoid the contaminated area or interferes with normal feeding and activity patterns, and evaluating the effect of crude oil exposure on defensive behavior of a sea urchin; (2) to investigate the metabolism and disposition of petroleum hydrocarbons in demersal fish; (3) to develop and refine ultrastructural criteria for assessing cellular damage in marine organisms resulting from exposure to petroleum; (4) to detect and characterize pathological changes resulting from the exposure of flatfish to sediments contaminated with crude oil and to detect effects of petroleum exposure on flatfish disease resistance; and (5) to determine if petroleum-exposed eggs and larvae of salmon and flatfish develop abnormally, and to evaluate the effect of any detected abnormalities on survival. The conclusions of this program are summarized according to disciplinary areas of study. Research findings from this program have clear implications with respect to petroleum effects on aquatic species and consequently to OCS oil and gas development. (Sinha-OEIS)
W80-04954

BEAUFORT SEA BARRIER ISLAND-LAGOON ECOLOGICAL PROCESS STUDIES. SECTION I - AVIAN ECOLOGY IN SIMPSON LAGOON, BEAUFORT SEA, ALASKA,
LGL Ltd., Edmonton (Alberta).
S. R. Johnson.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol VI, Effects, p 238-362, October 1979. 7 Fig, 31 Tab, 35 Ref, 2 Append, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. 03-6-022-35193.

Descriptors: *Birds, *Ecology, *Habitats, *Environmental effects, Alaska, Migration, Breeding, Resources development, Oil industry, *Outer Continental Shelf, Petroleum development, Feeding, Molting, Beaufort Sea, Simpson Lagoon.

The general scope of the ornithological components of this study, which was sited primarily in the Simpson Lagoon area, was to characterize the use of nearshore habitats by birds and to clarify those critical feeding and habitat dependencies that development is likely to affect either directly, or indirectly via alteration of ecosystem processes. The research program addresses four ecosystem uses/dependencies of birds--for migration, breeding, feeding and staging-molting. These uses are evaluated as they relate to barrier island-lagoon habitats and predicted development alterations of habitats. Some general conclusions were that: (1) bird utilization of nearshore lagoon areas was minimal while these areas remained frozen in spring and early summer so that potential impacts of development are probably low at this time except for those activities that would create open water attractive to birds; (2) heaviest use of near-shore barrier island-lagoon areas by birds occurred during the open-water season--late July through August and September. Primary use of the area at this time was by molting and migrating oldsquaws and staging shorebirds. Feeding activity in the area was intensive by all these birds. Potential impacts of development would be most serious during this open-water season. (Sinha-OEIS)
W80-04956

BEAUFORT SEA BARRIER ISLAND-LAGOON ECOLOGICAL PROCESS STUDIES. ECOLOGY OF INVERTEBRATES IN SIMPSON LAGOON, BEAUFORT SEA, ALASKA,
LGL Ltd., Edmonton (Alberta).
W. B. Griffiths, and R. E. Dillinger.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol VI, Effects, p 471-600, October 1979. 28 Fig, 22 Tab, 74 Ref, 10 Append, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. 03-6-022-35193.

Descriptors: *Invertebrates, *Ecology, *Oil pollution, *Sediments, *Environmental effects, *Water pollution effects, Lagoons, Barrier islands, Currents, Resources development, Alaska, *Outer Continental Shelf, Beaufort Sea, Simpson Lagoon, Epibenthic community, Nearshore currents, Environmental impact, Petroleum development.

Invertebrate investigations in the Simpson Lagoon area on the Alaskan Beaufort Sea Coast concentrated on those organisms identified as important food items to higher trophic levels (fish and birds). The main objectives of the research were to study the seasonal and habitat distributions, abundances and biomasses, and life histories of these important organisms. A potential cause of adverse impacts to epibenthic invertebrates is the construction of causeways or other structures that would block important movements of these invertebrates. The movements that appear important to some of the species include those between the lagoon and off-

shore. Another potential disturbance related to petroleum development on the continental shelf is contaminant (e.g., oil) introductions. Adverse impacts of oil on invertebrates might indirectly affect the fish and birds that depend on those invertebrates for food. Previous investigations have shown that responses of epibenthic invertebrates to oil are highly variable, but that adverse effects occur under some circumstances. In the nearshore environment, invertebrates could be affected by oil in the water column or (probably more critical to epibenthos) by oil on and in benthic substrates. (Sinha-OEIS)
W80-04958

BEAUFORT SEA BARRIER ISLAND-LAGOON ECOLOGICAL PROCESS STUDIES. OCEANOGRAPHIC AND GEOLOGIC PROCESSES--A SYNTHESIS OF ECOLOGICALLY IMPORTANT INFORMATION,
LGL Ltd-U.S., Inc., Grand Junction, CO.
J. C. Truett.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol VI, Effects, p 601-664, October 1979. 2 Fig, 102 Ref. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. 03-6-022-35193.

Descriptors: *Geomorphology, *Resources development, *Water circulation, Geology, Baseline studies, Alaska, Transport, Environmental effects, Water pollution effects, *Outer Continental Shelf, Beaufort Sea, Coastal processes, Petroleum development, Ecological crises.

This report synthesizes and interprets, from reports of Barrier Island-Lagoon Program participants and from the general literature, data about selected oceanographic and geologic processes in coastal regions. Processes discussed are water circulation and exchange; detritus sources, transport mechanisms and sinks; and the origin and evolution of coastal landforms. The purpose of the synthesis is to provide a more realistic assessment of the ecological consequences of man's alteration of these processes in the Beaufort Sea. The processes investigated are those which strongly influence populations of selected key species of animals in the coastal environment and those affected by oil and gas exploration and development activities on the continental shelf. (Sinha-OEIS)
W80-04959

OBSTACLES TO GEOTHERMAL DEVELOPMENT,
S. P. Budiansky.
Environmental Science and Technology, Vol 14, No 3, p 255-257, March, 1980. 1 Fig.

Descriptors: *Geothermal studies, *Legal aspects, *Financial feasibility, *Environmental effects, Ground water, Water pollution, Land subsidence, Water table, Air pollution, Hydrogen sulfide, Water law.

Legal, financial, and environmental problems associated with geothermal development are minor compared with problems associated with the development of other energy resources. However, these problems must be solved if delays are to be avoided. Direct use of geothermal energy, unlike high-temperature applications, does not cause air pollution but can result in water pollution. The use of injection wells can minimize ground water pollution, water table lowering and land subsidence. The deterioration of ground water quality surrounding an injection well over a 30 year period has been simulated by researchers at EG and G Idaho. Direct use applications are also faced with laws and regulations which were based on the concept of high-temperature, electric-generating, and revenue producing resources. These laws do not apply to low-temperature resources. With some modification, existing water law can provide the basis for direct use development. For example, geoheating would be classified as 'reasonable use' of water resources, and appropriate rights over the entire volume of the resource should not be required for closed systems which return the water they use. (Purdin-NWWA)
W80-04983

THE SIGNIFICANCE OF VITAMINS AND THE EPIPHYTIC BACTERIAL COMMUNITY IN THE NUTRITIONAL ECOLOGY OF CLADOPHORA GLOMERATA,
Wisconsin Univ.-Madison. Dept. of Botany.
J. P. Hoffmann, and G. C. Gerloff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182793, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, University of Wisconsin Technical Completion Report WIS WRC 80-07, 1980. 24 p, 8 Fig, 6 Tab, 40 Ref. OWRT A-074-WIS(1), 14-34-0001-7105; 14-34-0001-7106; 14-34-0001-8053.

Descriptors: *Vitamin B, *Chlorophyta, *Algae, *Nuisance algae, *Bacteria, *Growth rates, Analytical techniques, Statistical methods, Effects, Temperature, Light intensity, Photoperiodism, Nutrients.

The effects of vitamin B1, vitamin B12, temperature, light intensity and photoperiod on growth and zoosporogenesis were investibated by factorial experiments. Statistical analysis showed all effects to be significant as well as some of the interaction terms. Zoosporogenesis was more sensitive to vitamin limitation than was dry weight production. Growth and dry weight production exhibited significantly different optima. Growth was most strongly influenced by temperature whereas photoperiod exerted the strongest influence on zoosporogenesis. Due to the experimental design it was possible to separate the light intensity and photoperiod effects and analysis showed photoperiod to have a primary influence on zoosporogenesis. An 8:16 short day photoperiod elects the greatest number of zoosporangia.
W80-05008

AGRICULTURAL LAND USE: EFFECTS ON THE CHEMICAL QUALITY OF RUNOFF,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W80-05012

PHYTOPLANKTON AND ENVIRONMENTAL CONDITIONS IN CENTRAL AND COASTAL AREAS OF THE BOTHNIAN BAY,
Oulu Univ. (Finland). Perameri Research Station.
E. Alasaarela.
Annales Botanici Fennici, Vol 16, No 3, p 241-274, 1979. 23 Fig, 4 Tab, 136 Ref, 1 Append.

Descriptors: *Basic data collections, *Phytoplankton, *Nutrients, *Bothnian Bay(Finland), *Primary productivity, Sampling, Salinity, Temperature, Hydrogen ion concentration, Phosphorus, Phosphate, Iron, Nitrogen, Nitrates, Color, Chlorophyll, Biomass, Diurnal distribution, Algae, Hydrography, Chlorophyta, Coastal waters, Dinoflagellates, Diatoms, Chrysophyta, Cryptophyta, Cyanophyta, Surveys, Finland, Baltic Sea.

The seasonal variation of phytoplankton production, biomass and species composition, and the environmental factors regulating them in the Bothnian Bay, Baltic Sea, were studied in 1976 and 1977 as part of the basic biological survey made of the coastal waters off Oulu, Finland. The outermost sampling stations represent the open waters of Bothnian Bay, while the coastal area is influenced by river waters polluted by industrial and domestic sewage. Results showed that in summer, the surface salinity was 1-3% in the coastal waters and 3.0-3.2% in the open sea. In April, when incident radiation was high, a relatively dense phytoplankton community developed under the ice in both areas. In summer, phytoplankton production showed two peaks in the coastal waters, which were not clearly discerned in the open sea where the primary production and phytoplankton biomass were low. In the open sea, phosphate was very scarce but nitrate was fairly abundant. The phosphate concentration was notably higher in the coastal waters, but nitrate was depleted by the early summer phytoplankton maximum. Hydrography and nutrients considered were temperature, salinity, pH, transparency, iron, phosphorus, nitrogen, and total nitrogen to total phosphorus ratio. Chlorophyll-a, total phytoplankton biomass, daily and annual primary production, thickness of the euphotic layer, intensity and diurnal variation of primary production and important phytoplankton groups and species were also reported. (Luedtke-Wisconsin)
W80-05020

LIGHT INDEPENDENT CARBON FIXATION BY MARINE MACROALGAE,
Cologne Univ. (Germany, F.R.). Botanisches Inst.
B. P. Kremer.
Journal of Phycology, Vol 15, No 3, p 244-247, September 1979. 3 Tab, 13 Ref.

Descriptors: *Marine algae, *Carbon cycle, *Intertidal areas, *Kelps, *Photosynthesis, Marine microorganisms, Carbon fixation, Chlorophyta, Rhodophyta, Phaeophyta, Carboxylation, Dark carbon fixation, Carboxylating enzymes.

Several marine macroalgae representative of Chlorophyceae, Rhodophyceae, and Phaeophyceae were investigated for their potentials of photosynthesis and light independent (dark) carbon fixation. Photosynthesis rates, expressed as net carbon assimilation on a dry weight basis, were of the same order of magnitude in all algal classes. The amounts of photosynthetically fixed carbon on thallus surfaces ranged between 30 and 80 micromol C02/sq dm/hour, and were comparable to the photosynthetic capacities of average terestrial plants. Phaeophyceae achieved considerable rates of light independent carbon fixation, which exceeded photosynthetic rates by 4-5%. In contrast to the species of Chlorophyceae and Rhodophyceae examined, Phaeophyceae showed high activities of phosphoenolpyruvate carboxykinase (PEP-CK) in absolute terms and relative to ribulose-1,5-bisphosphate carboxylase (RubP-C). The composition of the soluble fraction after dark fixation of 14C02 was different from that after photosynthetic carbon assimilation. The neutral fraction of soluble carbohydrates and of organic phosphates accounted for less than 3% of the total C14-labelled assimilates were amino acids (aspartate, glutamate, alanine, and glutamine) and intermediates of the tricarboxylic acid cycle. Asparate, alanine, and citrate constituted the most strongly C14-labelled compounds in the Phaeophyceae, while citrate, although less strongly C14-labelled, was significant in the Rhodophyceae. (Harris-Wisconsin)
W80-05021

SHORT-TERM RESPONSES OF NUTRIENT-DEFICIENT ALGAE TO NUTRIENT ADDITION,
Department of Fisheries and Oceans, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W80-05022

CHLORIDE UPTAKE BY ANACYSTIS NIDULANS (CYANOPHYCEAE),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
S. R. Craig, and K. Budd.
Journal of Phycology, Vol 15, No 3, p 300-304, September 1979. 3 Fig, 3 Tab, 19 Ref.

Descriptors: *Chlorides, *Cyanophyta, *Cytological studies, *Nutrient transport, *Photosynthesis, *Metabolism, Kinetics, Algae, Anacystic, Light, Darkness, Biochemistry, Respiration, Inhibitors, Cultures, Tracers, Nutrients, Nutrient requirements, Bacteria, Energy.

Results of experiments investigating chloride uptake by cyanobacteria Anacystis nidulans show that light enhances chloride uptake; therefore, chloride uptake is active with ATP as the most likely energy source. Anacystis nidulans, grown in batch culture with 0.5% C02 in air, was supplied with chloride labelled with C1-36 in light and darkness. Chloride in cells reaches a maximum after 30-50 min at 25C. At this point, internal C1-concentrations are 60-fold external (0.1 mM) con-

centrations in light, 37-fold external concentrations in darkness. Relationships of C1- uptake to metabolism were investigated using DCMU and DCCD inhibitors and CCCP uncoupling agent. DCMU immediately stops oxygen evolution in light. CCCP has no detectable influence on photosynthesis or dark respiration below 1 microM; above this concentration photosynthesis is progressively inhibited whereas dark respiration is stimulated. DCCD, an energy-transfer inhibitor, progressively inhibits photosynthesis as time and concentration increase; however, dark respiration is unaffected or even stimulated. With DCMU at 10 micro M, light stimulation of C1- uptake occurs. CCCP strongly inhibits C1- uptake in light and darkness. DCCD has no effect on dark C1- uptake and inhibits light C1- uptake more slowly than photosynthesis. (Danovich-Wisconsin)
W80-05023

PHOSPHATE-LIMITED GROWTH KINETICS OF SELENASTRUM CAPRICORNUTUM (CHLOROPHYCEAE),
Alaska Univ., Fairbanks. Inst. of Water Resources.
E. J. Brown, and D. K. Button.
Journal of Phycology, Vol 15, No 3, p 305-311, September 1979. 4 Fig, 1 Tab, 35 Ref. NSF DEB77-08427.

Descriptors: *Phosphates, *Growth rates, *Kinetics, *Orthophosphate, *Selenastrum, Chlorophyta, Cultures, Nutrients, Limiting factors, Cytological studies, Metabolism, Speciation, Nutrient requirements, Monod equation, Michaelis-Menton equations, Phytoplankton, Algae, Phosphates.

Steady-state phosphate-limited growth kinetics of Selenastrum capricornutum were examined using continuous cultures to characterize the green alga's ability to compete for orthophosphate (OP) when OP limits growth. Comparable data obtained for aquatic yeast Rhosdotorula rubra and similar data for diatom Asterionella formosa indicate that both the heterotrophic yeast and the diatom have a competitive growth advantage over Selenastrum in OP-limited steady-state systems. Thus for Selenastrum to predominate in a mixed species environment truly limited by phosphorus, factors other than steady-state OP-limited growth must regulate total biomass production. Selenastrum maximum specific growth rate at 20C is 1.20/d, and the concentration where half maximal growth rate occurs is 40 nM OP. An apparent external phosphate threshold occurs at 10 nM OP, below which net phosphate is zero. Cell yields vary inversely with growth rate; thus ability to utilize OP can not be characterized in terms of Monod half-saturation constant and maximal growth rate. Instead, OP affinity is calculated from steady-state flux vs external OP concentrations. The steady-state flux derived phosphate affinity of this aquatic organism is relatively low, 2.8 l/mg dwt d. These experiments provide kinetic evidence against theoretical phytoplankton growth studies which assume that relative nutrient utilization abilities regulate species composition. (Danovich-Wisconsin)
W80-05024

A CONSIDERATION OF TROPHIC DYNAMICS IN SOME TALLGRASS PRAIRIE FARM PONDS,
Kansas State Univ., Manhattan. Div. of Biology.
J. A. Arruda.
The American Midland Naturalist, Vol 102, No 2, p 254-262, October 1979. 2 Fig, 3 Tab, 23 Ref.

Descriptors: *Primary productivity, *Predation, *Farm ponds, *Ecosystems, *Kansas, *Food chains, *Food pyramids, Biomass, Trophic level, Variability, Population dynamics, Ecotypes, Size, Aquatic insects, Aquatic populations, Biological communities, Balance of nature, Secondary productivity, Food abundance, Standing crops, Diptera, Grasslands.

Data from five farm ponds in Kansas, sampled in summer 1975, supported Fretwell's construct that some ecosystem patterns are explained by interactions between primary productivity and predation. While these two factors do not completely regulate these farm pond ecosystems, they account for some of the observed variation. The biological null hypothesis that no relationship exists between biomasses of the ponds' trophic levels and their primary production is rejected. Biomass increases by both primary and tertiary consumers, the food-limited levels, and decreases by both secondary consumers and littoral producers, the predator-limited levels, is consistent with Fretwell's construct. As primary production increases and organic matter is incorporated into higher trophic levels, the abundance of the top predator increases. Abundance of the predator-limited trophic level below it decreases because its predator is more abundant. The next trophic level below increases due to lower predation. Patterns in body size of two major consumers, damselfly naiads and chironomid larvae, are strongly corroborative of Fretwell's construct. Along with decline in biomass, damselfly naiads' mean body size decreases. The opposite is true for midge larvae; they are larger where biomass increased and individual numbers decreased. These latter results occur when predator pressure decreases and competitive interactions in the new food-limited environment are more severe. Data are suggestive of patterns in ecosystem structure: patterns mediated by interactions between energy available to consumers and predation intensity. (Danovich-Wisconsin)
W80-05025

EFFECT OF NITRIFICATION IN ORTA LAKE,
Consiglio Nazionale delle Ricerhe, Milan (Italy).
M. Gerletti, and A. Provini.
Progress in Water Technology, Vol 10, No 6, p 839-851, 1978. 5 Fig, 5 Tab, 17 Ref.

Descriptors: *Nitrification, *Orta Lake, Italy, *Water chemistry, *Industrial wastes, *Hydrogen ion concentration, *Water pollution effects, Denitrification, Ammonia, Dissolved oxygen, Nitrates, Nitrites, Copper, Hypolimnion, Epilimnion, Ions, Seasonal, Hydrologic aspects, Chemical properties, Stratification, Alkalinity.

Lake Orta, Italy, subjected to industrial wastewaters from cuproammonia rayon factory since 1927, has a 1975 mean nitrification rate of 3-5 micro g N/l d because nitrification inhibiting substances are absent. Lake waters average 11 mg/l total inorganic nitrogen. Lake Orta has 18.1 sq km surface area, 143 m maximum depth and 71 m mean depth. Original natural alkalinity should have ranged 7-12 mg CaC03/l in relation to its granitic drainage basin; however, Orta has probably been acidic for 30 years. Ionic composition of lake waters gradually changed from a soft bicarbonate to a unique sulfate-nitrate-ammonia type with pH fluctuations governed by excess ammonia or nitric ions. Hypolimnion pH values are annually constant near 4; epilimnion pH values are low during winter and increase to 9 spring to autumn. Hypolimnetic temperature and pH do not vary significantly during the year; consequently nitrification is constant, although it is slow. Denitrification may occur in deep hypolimnion layers at the end of thermal stratification when oxygen concentrations are low. During spring to autumn 459-711 tons of ammonia are lost in the hypolimnion while nitrates increased slightly. During this time, nitrites are not important. Denitrification processes probably cause the observed changes. (Danovich-Wisconsin)
W80-05026

SEASONAL VARIATION OF DENITRIFICATION RATE IN SEDIMENT DETERMINED BY USE OF N15,
Danish Isotope Center, Copenhagen.
P. P. Madsen.
Water Research, Vol 13, No 5, p 461-465, 1979. 2 Fig, 3 Tab, 21 Ref.

Descriptors: *Seasonal, *Denitrification, *Tracers, *Arreso Lake, Denmark, *Lake sediments, *Laboratory tests, Sediments, Gases, Nitrogen, Nitrates, Analytical techniques, Methodology, Spectrometers, Isotope studies, Ammonia, Organic compounds, Nitrogen cycle.

Based on annual measured-rate constants and nitrate concentrations, approximately 10% of the total nitrogen loading of Lake Arreso, Denmark, is denitrified. Measurements performed March-November 1977 on Lake Arreso sediments indicate first-order kinetics of denitrification with respect to nitrate concentration; the first-order rate constant (KD) varies 0.4-40 micro sec. KD seasonal changes are due to variations in organic matter availability. Variations in oxidizable organic matter correlate to algae growth and sedimentation during the year. Maximum KD values occur in August coinciding with maximum sediment oxygen consumption. First-order nitrate reduction rate constant, KA, ranges 2-8 micro sec. An estimated 1.3 g N/sq m yr is denitrified; results are reasonable compared with a total 10-15 g N/sq m yr nitrogen loading. Arreso is a shallow, unstratified lake situated north of Copenhagen; it has a 41 sq km area and 7 m maximum depth. Determinations of nitrogen gas evolved from N15-labelled nitrate is based on isotope dilution. Gas evolved is spiked with unlabelled dinitrogen; N15-enrichment of the resulting gas mixture is measured by optical spectrometry. The method allows simultaneous measurements of nitrate reduced to ammonia and organic nitrogen. (Danovich-Wisconsin)
W80-05027

PHOSPHORUS LOADING FROM URBAN STORMWATER RUNOFF AS A FACTOR IN LAKE EUTROPHICATION: I. THEORETICAL CONSIDERATIONS AND QUALITATIVE ASPECTS,
Wisconsin Univ. Madison. Dept. of Soil Science.
M. G. Browman, R. F. Harris, J. C. Ryden, and J. K. Syers.
Journal of Environmental Quality, Vol 8, No 4, p 561-566, October-December 1979. 1 Fig, 4 Tab, 33 Ref. NSF AG-199, 40-193-69.

Descriptors: *Phosphorus, *Urban runoff, *Lake Wingra(WI), *Storm runoff, Theoretical analysis, Phosphorus compounds, Inflow, Runoff, Organic compounds, Leaves, Orthophosphate, Hydrographs, Sampling, Settling velocity, Seasonal, Flow, Flow profiles, Flow rates, Nutrients, Nutrient loading.

Theoretical fractionation of urban phosphorus (P) runoff reveals that for major loading phases of runoff events, a significant proportion (35-50%) of particulate P commonly remains in suspension in the photic zone for several days, interacting with lake water and biological components. Urban P runoff from two separate storm sewer systems draining residential areas in the Lake Wingra Basin, Madison, Wisconsin, were monitored fall 1971-summer 1972. In general, the highest total dissolved P levels are obtained in fall and spring runoff, coinciding with leaf fall and elm fruit fall, respectively. Dissolved inorganic P constitutes at least 79% and often > 90% of total dissolved P, indicating that almost all dissolved P in this runoff is directly available for algal uptake subject to other conditions such as light and temperature. Flow-weighted mean concentrations of total particulate P ranges 0.14-2.37 mg P/l; for dissolved inorganic P concentrations are 0.10-2.11 mg/l for individual runoff events. For all flow periods, a major portion of the total particulate P comprises particles that settle very slowly (<0.1 cm/min); in low-flow periods 74%-80% fall into this class. These particles are likely to remain in the photic zone for several days. Particles settling at >1 cm/min provide significant portions (18%-34%) of total particulate P during initial flush and highflow periods, but contribute nothing to the subsequent low-flow period. (Danovich-Wisconsin)
W80-05029

SEASONAL VARIATION OF PSYCHROTROPHIC BACTERIA IN SEDIMENT FROM LAKE ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
W. E. Inniss, and C. I. Mayfield.
Water Research, Vol 13, No 6, p 481-484, 1979. 3 Tab, 18 Ref.

Descriptors: *Seasonal, *Bay of Quinte, Lake Ontario, *Bacteria, *Sediments, *Water temperature, Great Lakes, Lake sediments, Population dynamics, Growth rates, Population, Speciation, Biomass, Cultures, Temporal distribution, Heated water,

Pseudomonas, Flavobacterium, Chromobacterium, Sampling, Sediment-water interfaces.

Regardless of season, all sediment samples collected from the Bay of Quinte, Lake Ontario, July and November 1977 and February and May 1978, contain large psychrotropic bacterial populations. Sediment temperature range is 18.8C, 4C, 4C and 5C in July, November, February and May, respectively. Sediments with lower insitu temperatures have higher numbers of viable bacteria. Sediment temperature affects not only bacteria numbers but also population composition. November, February and May samples contain a greater percentage of chromogenic bacteria than the July sample. Bacteria isolated from any given sample and incubated at 20C give equal or higher numbers than sediments incubated at 0C. Almost all bacteria isolated at 0C in July also grow at 20C; even in February and May samples, 90% of the population isolated at 0C grows at 20C. Only 73% of the bacteria isolated at 20C in July grows at 0C, with higher percentages in November, February and May sediment samples. Pseudomonas dominates in July samples at both 0C and 20C isolation temperatures, whereas Flavobacterium prevails in November, February and May samples. Pseudomonas and Flavobacterium are the most frequently isolated genera. Chromobacterium is found in relatively low numbers in November, February and May samples. Diversity is higher in colder sediments; the July sample has the lowest population diversity. (Danovich-Wisconsin)
W80-05030

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN TRANSFORMATIONS IN SIMULATED LAKE SEDIMENT-WATER SYSTEMS,
Wisconsin Univ. Madison. Dept. of Soil Sciences.
R. L. Chen, D. R. Keeney, and L. J. Sikora.
Journal of Environmental Quality, Vol 8, No 3, p 429-433, July-September 1979. 4 Fig, 4 Tab, 18 Ref. EPA R-802692-01-0.

Descriptors: *Nitrogen cycle, *Lake restoration, *Aeration, *Cox Hollow Lake(WI), *Oxidation-reduction potential, Lakes, Nitrogen, Eutrophication, Anaerobic conditions, Cycling nutrients, Nitrification, Denitrification, Sediment-water interfaces, Laboratory tests, Chemical analysis, Nitrates, Nitrites, Ammonia, Hypolimnion.

Laboratory tests of nitrogen (N) transformations on lake water and sediment samples obtained from Cox Hollow Lake, a southwestern Wisconsin recreational impoundment, occurs soon after hypolimnion aeration. Therefore, hypolimnion aeration is not an effective way to remove N from lakes. However, shortly after nitrification occurs in aerated lakes, the rate of nitrare formation is limited by ammonia depletion. Nitrates are subject to several reactions; some interact with the diffuse sediment-water interface where they encounter a highly reduced environment. In Cox Hollow sediment, 60-65% of the nitrates are immobilized to ammonia and organic N. Hence, although nitrates disappear from the hypolimnion during aeration, a large net N loss does not occur. Other studies show that Lake Mendota sediments immobilize 30% and Green Bay sediments (WI), 10% of the nitrates added. Larger net N losses by denitrification are expected if aeration is discontinued at maximum nitrate accumulation, which occurs two weeks after initial aeration in these experiments. Cox Hollow Lake has 8.8 m maximum depth and loses its dissolved oxygen below 2 m during summer stratification. Samples were collected at 8.5 m in July 1975. (Danovich-Wisconsin)
W80-05031

CELLULOSE PRODUCTION BY PLANKTONIC ALGAE IN LACUSTRINE ENVIRONMENTS,
Massachusetts Univ. Amherst. Dept. of Environmental Sciences.
J. Rho, and W. Litsky.
Hydrobiologia, Vol 66, No 3, p 249-258, October 1979. 3 Fig, 6 Tab, 21 Ref.

Descriptors: *Phytoplankton, *Carbohydrates, *Cellulose, *Lentic environment, *Lakes, Eutrophication, Farm ponds, Oligotrophy, Photosynthesis, Organic matter, Chlorophyta, Cyanophyta, Primary productivity, Quabbin Reservoir, Massachusetts, Decomposing organic matter, Degradation(Decomposition), Seasonal, Algae, Speciation.

Cellulose production by planktonic algae in an eutrophic pond (Amherst, Massachusetts) and in an oligotrophic lake (Quabbin Reservoir, Massachusetts) indicates that algal cellulose production exceeds decomposition and cellulose remains in the water column for long time periods. Absorption spectra of C-fractions extracted from algal cells indicate that algae are the major cellulose contributors of particulate matter. In both the lake and pond, various Chlorophyceae are the most common algal cellulose producers. Cellulose content of dominant algal cellulose producers ranges 2%-39% of total dry weight, depending on algal species and growth phase. Amounts of cellulose present in the water column range 4%-50% of total particulate matter dry weight. Cellulose contents are higher in the eutrophic system than in the oligotrophic system, probably due to presence of larger phytoplanktonic crops in the eutrophic system. During summer months, when algal populations reach maximum, particulate matter cellulose content ranges 8%-31%. During winter and spring, when algal populations are low, the cellulose percentage in water column varies 0.1%-2%. More cellulose is present in the water column than is accounted for by the number of algal cells observed. Differences are due to cellulose accumulation from previous algal crops. (Harris-Wisconsin)
W80-05032

SPECIATION AND RATE OF LOSS OF COPPER FROM LAKEWATER WITH IMPLICATIONS TO TOXICITY,
Department of Fisheries and Oceans, Winnipeg (Manitoba). Freshwater Inst.
R. Wagemann, and J. Barica.
Water Research, Vol 13, No 6, p 515-523, 1979. 4 Fig, 6 Tab, 39 Ref.

Descriptors: *Copper, *Toxicity, *Manitoba, Canada, *Algicides, *Chemical reactions, Algae, Algal control, Algal poisoning, Algal toxins, Water chemistry, Hydrogen ion concentration, Lakes, Copper compounds, Copper sulfate, Inorganic compounds, Copper sulfate, Kinetics, Equilibrium, Biochemistry, Cyanophyta.

Copper effectiveness as an algicide in lakes in southwest Manitoba depends upon the total toxic copper concentration, which is equal to the sum of three species ($Cu+2$, $CuOH+$, $Cu(OH)0$ sub 2). Total toxic copper explains the unexpectedly high effectiveness of copper as an algicide in aquatic systems with relatively high pH. Total toxic copper is larger in the six prairie, pothole, hard-water lakes, at any time, than cupric ion concentration alone by a factor 320-7400, depending on the lake. This is mainly due to relatively high pH in these lakes; at $pH > 8$, total toxic copper is essentially all $Cu(OH)0$ sub 2. Free cupric ion concentrations ($<0.5\%$ total dissolved copper) are also low due to high organic matter concentrations. For all lakes but one, first-order rate constants for total dissolved copper (TDCu) disappearance from water column ranges 0.47-1.01/d and corresponding half-time ranges 1-2 d. The rate constant for the other lake is 0.11/d and corresponding half-time 7 d. This lake differs chemically from the other lakes and is not typical of the area since it is large and has intermittent outflow and sandy sediments. Other lakes are small and shallow, have no permanent inlet or outlet, and have heavy clay sediments. A nearly constant, steady-state concentration is attained in all lakes 10 days after copper sulfate is added. Precipitation of tenorite, malachite and azurite substantially reduces TDCu concentrations. Physical adsorption of copper onto sediments and seston activity also reduce TDCu concentrations. (Danovich-Wisconsin)
W80-05034

EFFECTS OF TWO AROCLOR FRACTIONS ON THE PRODUCTIVITY AND DIVERSITY OF ALGAE FROM TWO LENTIC ECOSYSTEMS,
Wheaton Coll., Norton, MA. Dept. of Biology.
J. C. Kricher, C. L. Bayer, and D. A. Martin.
International Journal of Environmental Studies, Vol 13, No 2, p 159-167, 1979. 10 Tab, 23 Ref.

Descriptors: *Aroclors, *Polychlorinated biphenyls, *Algae, *Water pollution effects, *Stony Brook Pond(MA), *Norton Reservoir(MA), Phytoplankton, Water pollution, Pollutants, Primary productivity, Laboratory tests, Cultures, Speciation, Tracers, Biochemistry, Diatoms, Cyanophyta, Chlorophyta, Lentic envirnment, Growth rates, Massachusetts.

In algal communities in Norton Reservoir and Stony Brook Pond, located 22.5 km apart in southeastern Massachusetts, polychlorinated biphenyl (PCB) Aroclor 1232 is more severe in its effects than Aroclor 1254. During summer 1976, algal communities from these lakes were exposed in laboratory cultures to Aroclor, the only PCB manufactured in the U.S. Both lakes have quite distinct algal communities: Norton Reservoir is characterized by large numbers of Cyanophyceae species whereas Stony Brook Pond is dominated by Bacillariophyceae and Chlorophyceae. Although algal communities are different, both respond similarly to laboratory PCB exposures. Carbon fixation rates following a 24 hr exposure to 1 ppm Aroclor 1232 and 1 ppm 1254 are greatly reduced compared with both untreated and 0.1% acetone controls. Productivity depression is significantly greater in the Aroclor 1232 series than in 1254. Treatment with 100 ppb 1232 also reduces productivity in both ecosystems but not nearly to the degree that 1 ppm does. Lethal PCB effects are inversely related to chlorine content. Algal communities differ in the extent of productivity depression incurred by acetone. Norton 0.1% acetone controls decrease C14 uptake by 23.4% compared with untreated controls whereas only an 11% decrease is observed for Stony Brook. Algal response results from a differential effect of acetone on Cyanophyte physiology. Another difference occurs when Aroclor 1254 at 100 ppb increases C14 uptake compared with acetone controls in Norton cultures, whereas in Stony Brook, ppb 1254 decreases productivity 23% compared with the acetone series. (Danovich-Wisconsin)
W80-05035

THE RESPONSE OF BENTHIC PLANTS TO PAST LEVELS OF HUMAN USE IN HIGH MOUNTAIN LAKES IN KINGS CANYON NATIONAL PARK, CALIFORNIA, U.S.A.,
California Univ., Berkeley. Dept. of Forestry and Conservation.
T. P. Taylor, and D. C. Erman.
Journal of Environmental Management, Vol 9, No 3, p 271-278, November 1979. 2 Fig, 2 Tab, 30 Ref.

Descriptors: *Kings Canyon National Park(CA), *Nitrates, *Benthic flora, *Recreation wastes, *Water pollution effects, Lakes, Recreation, Iron, Rooted aquatic plants, Alpine, Elevation, Mountains, Recreation demand, Nutrients, Algae, Oligotrophy, Cycling nutrients, Nutrient loading, Macrophytes.

Observations of bottom flora in August 1977 showed that rooted aquatic plants have increased in remote high elevation lakes in Kings Canyon National Park, California. Unrestricted human recreational activities in these lakes during the 1950s and 1960s probably produced large nutrient inputs which are still stimulating present benthic flora growth. Rooted macrophytes (Isoetes, Anacharis, Nitella) as well as bottom algae (Rhizoclonium) cover more of the bottom on lakes with historically higher human use levels. Historic human use contributes nutrients which slowly accumulate in lake sediments. As a result, lakes with more nutrients produce an increased abundance of bottom flora, have lower nitrate concentrations in the water column because of uptake by rooted plants, and have higher total iron concentrations. Mean nitrate concentrations range 0-156 micro g/l with East Kearsarge, Upper Sixty and Upper Rae having high concentrations. Mean total iron concentrations range 4-36 micro g/l with Upper Kear-

sarge having the highest concentration. Mean benthic flora frequencies range 0-100%. Upper Kearsarge, Lower Rae and Bullfrog have high rooted aquatic plant abundance whereas in East Kearsarge and Upper Sixty Lakes, no plants are encountered. East Kearsarge, Lower Sixty and Upper Sixty lakes have low human impact values, while Bullfrog, Charlotte and Lower Rae lakes have exceptionally high values. (Danovich-Wisconsin)
W80-05036

THE UPTAKE OF CHEMICAL ELEMENTS FROM COAL ASH AND SETTLING BASIN EFFLUENT BY PRIMARY PRODUCERS I. RELATIVE CONCENTRATIONS IN PREDOMINANT PLANTS,
Texas Univ. Health Science Center at Houston. School of Public Health.
R. K. Guthrie, and D. S. Cherry.
The Science of the Total Environment, Vol 12, No 3, p 217-222, August 1979. 2 Tab, 15 Ref. AEC AT(38-1)824.

Descriptors: *Rooted aquatic plants, *Chemicals, *Fly ash, *Bioaccumulation, *Savannah River Project(SC), Macrophytes, Biochemistry, Coals, Electric powerplants, Electric power production, Heavy metals, Toxicity, Cattails, Cyanophyta, Water chemistry, Sediments, Water pollution effects, Neutron activation analysis.

Chemical analysis of predominant plants in the ash settling basin drainage system of the Savannah River Project, Aiken, South Carolina, January-December 1974, revealed that the aquatic producers which bioaccumulate chemicals released in coal ash effluents are important and efficient chemical removal mechanisms. Duckweed (Lemna perpusilla) predominates throughout the year; other producers include cattail (Typha latifolia), Pontederia, bald cypress (Taxodium distichum) and algae (Oscillatoria and Hydrodictyon). Mean annual chemical concentrations are highest in sediments and lowest in water for the entire drainage system. Some exceptions are Mn (highest in cattail, 425 ppm), Cl (higher in all plants except Hydrodictyon), Cd (highest in cattail, 1.9 ppm; lowest in cypress, 0.05 ppm), Br (higher in all plants), Sb (highest in Oscillatoria, 2.4 ppm), and Hg (highest in Oscillatoria, 0.9 ppm; lowest in cypress, 0.005 ppm). Of potential macronutrients Fe, Ca, K and Mg, Fe is most highly concentrated by Hydrodictyon and duckweed; Ca by cattail; K by Pontederia and cattail; and Mg by cattail and duckweed. Cu and Zn concentrations are highest in Oscillatoria and lowest in cypress. Cypress leaves accumulate least amounts of the elements measured and do not concentrate any element to the greatest extent. The Savannah River Project power plant burns 451,940 metric tons coal/yr and produces 32,650 metric tons ash which is sluiced into a settling basin by 4.9 billion l water. (Danovich-Wisconsin)
W80-05038

EFFECT OF CYSTEINE AND METHIONINE ON SULFATE UPTAKE AND PRIMARY PRODUCTIVITY BY AXENIC CULTURES AND LAKE MICROPLANKTON COMMUNITIES,
New York State Museum, Albany.
R. H. Monheimer.
Journal of Phycology, Vol 15, No 3, p 284-288, September 1979. 3 Fig, 18 Ref. NSF DEB 76-10591.

Descriptors: *Sulfates, *Kinetics, *Primary productivity, *Phytoplankton, *Organic compounds, *Metabolism, Algae, Anabaena, Nannoplankton, Sulfur, Navicula, Ankistrodesmus, Speciation, Cultures, Biological communities, Water pollution effects, On-site tests, Lake George(NY), Tracers, Canadarago Lake(NY), Plant physiology, New York.

Culture and in-situ experiments (April-October 1976) examining effects of organic sulfur (S) on sulfate uptake by algae and naturally occurring microplankton communities concluded that algal sulfate uptake and primary productivity will probably not be influenced by dissolved organic matter additions to waters. In most fresh water systems, organic S pollution effects on algal sulfate uptake and primary productivity are insignificant when compared to other ecological changes which overshadow any such effects. Equimolar mixtures of cysteine and methionine (organic S) in 500 microg S/l concentrations have no effects on Navicula pelliculosa sulfate uptake rates. However, this mixture decreases sulfate uptake rates of Ankistrodesmus falcatus; uptake rates of Anabaena flos-aquae are decreased by 50 microg organic S/l. In these axenic cultures, primary productivity also decreases in A. falcatus. In situ isotope uptake experiments took place in oligotrophic Lake George and eutrophic Canadarago Lake, New York. Effects of organic S additions on sulfate uptake and primary productivity are in basic agreement with, but less pronounced than, parallel effects on algal cultures. Sulfate uptake rates, relative to primary productivity, are higher when diatoms and blue-green algae are present; and lower when green algae are present. Additions of cysteine/methionine mixtures to lake waters decrease microplankton sulfate uptake rates in correlation with algal community composition. Primary productivity decreases upon cysteine/methionine additions when green algae are relatively abundant. (Danovich-Wisconsin)
W80-05039

LAKE ECOSYSTEMS: A POLYHEDRAL DYNAMICS REPRESENTATION,
New York Univ., NY. Dept. of Computer Applications and Information Systems.
J. Casti, J. Kempf, L. Duckstein, and M. Fogel.
Ecological Modelling, Vol 7, No 3, p 223-237, September 1979. 3 Fig, 4 Tab, 13 Ref. NSF ENG 76 20280.

Descriptors: *Polyhedral dynamics, *Lakes, *Methodology, *Eutrophication, Systems analysis, Water quality, Nutrients, Light, Phytoplankton, Zooplankton, Model studies, Q-analysis, Food chains, Ecosystems, Dynamics, Fish, Productivity, Graphical analysis, Equations.

Polyhedral dynamics, a type of systems methodology based on topology, is presented as a technique for modeling the global structure and dynamic behavior of water quality problems in the aquatic ecosystem. The lake ecosystem, composed of organic and inorganic nutrients, light, phytoplankton, zooplankton, and fish is presented as a multidimensional graph using a technique called Q-analysis. Then a flow pattern is superimposed upon the Q-analysis to describe the dynamic behavior of the system. The utility of the method is demonstrated by looking at the effects of eutrophication. Q-analysis results correlate well with the traditional concept of a food chain. Also, the dynamic changes in the ecosystem caused by nutrient addition are seen to be a result of limits on matter and energy flow through the ecosystem imposed by the structure as it is defined by the Q and obstruction vectors. This insight can not be easily reached by traditional differential equation representations. Consideration of the dynamic behavior gives a quantitative basis to the qualitative changes which an ecosystem undergoes as a result of increased nutrient loading. Thus the approach may be used to assess the effectiveness of alternative eutrophication control methods. However, the nonlinear nature of the pattern defined by the analysis makes a more quantitative analysis difficult. (Luedtke-Wisconsin)
W80-05040

SEASONAL DISTRIBUTION AND ABUNDANCE OF MARINE BIRDS IN ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
C. J. Lensink, and P. J. Gould.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 1-6, October 1979. 19 Ref, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Birds, *Data collections, Resources development, Alaska, Seasons, Environmental effects, Water pollution effects, Baseline studies, *Outer Continental Shelf, Petroleum development, Seasonal distribution, Gulf of Alaska, Bering Sea, Beaufort Sea, Chukchi Sea.

Over 10,000 transects have been completed which equates to over 100,000 computer cards or over 1,000,000 pieces of information. This data base contains information derived from shipboard and aerial surveys of birds in all of Alaska's marine habitats. The greatest bulk of data is from the Gulf of Alaska, particularly in the Kodiak region. A substantial amount of data from the Bering Sea and a small amount from the Chukchi and Beaufort Seas is also present. Information on the distribution and abundance of marine birds over the outer continental shelf of Alaska is critical for the establishment of methods for preventing or mitigating impacts associated with the development of petroleum reserves. (Sinha-OEIS)
W80-05041

POPULATION DYNAMICS AND TROPHIC RELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5B.
W80-05042

THE BREEDING BIOLOGY OF MARINE BIRDS ASSOCIATED WITH CHINIAK BAY, KODIAK ISLAND, 1975-1978,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5B.
W80-05043

BREEDING BIOLOGY AND FEEDING HABITS OF SEABIRDS OF SITKALIDAK STRAIT,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5B.
W80-05044

THE PELAGIC BIRDS OF TUXEDNI WILDERNESS, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
R. D. Jones, Jr., and M. R. Petersen.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 187-232, October 1979. 10 Fig, 8 Tab, 23 Ref, Append. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-01-5-022-2538.

Descriptors: *Birds, *Breeding, *Food habits, *Ecology, Environmental effects, Resources development, Water resources, Aircraft, Baseline studies, Alaska, *Outer Continental Shelf, Gulf of Alaska, Petroleum development, Disturbances, Noise pollution, Pelagig birds.

A study of seabird colonies on Chisik and Duck Islands comprising the Tuxedni Wilderness in lower Cook Inlet is reported. Productivity statistics concerning black-legged kittiwakes and horned puffins are compiled through their incubation and nestling stages to fledgling. Observations of common murres and glaucous-winged gulls are recorded on a more incidental base. The gulls emerged as an important predator of kittiwakes and murres. The kittiwakes (a surface feeder) failed in the reproductive effort, while the puffins (a diver) achieved success. Both of these species fed on Pacific sand lance, puffins exclusively and kittiwakes nearly so. It is believed kittiwakes failed because this fish did not enter surface wates in substantial numbers, but puffins found them in deeper layers. The kittiwakes have failed in three of four known breeding attempts, which argues a need to continue the studies and to study the fish. Airplanes, particularly helicopters on OCS related activities, create disturbances that expose kittiwake eggs and nestlings to predation by overabundant glaucous-winged gulls. (Sinha-OEIS)

W80-05045

REPRODUCTIVE ECOLOGY OF SEABIRDS AT MIDDLETON ISLAND, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5B.
W80-05046

THE WINTER FEEDING HABITS OF SELECTED SPECIES OF MARINE BIRDS IN KACHEMAK BAY, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Ecosystems.
For primary bibliographic entry see Field 5B.
W80-05047

NEARSHORE FEEDING ECOLOGY OF MARINE BIRDS IN THE KODIAK AREA, 1978,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
L. D. Krasnow, G. A. Sanger, and D. W. Wiswar.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 348-394, October 1979. 16 Fig, 4 Tab, 22 Ref, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-01-5-022-2538.

Descriptors: *Birds, *Food habits, *Ecology, *Water pollution effects, Environmental effects, Resources development, Baseline studies, Food chains, Oil spills, Alaska, *Outer Continental Shelf, Kodiak Island, Gulf of Alaska, Petroleum development.

A study of the feeding habits of marine birds in the nearshore waters of the Kodiak Island area was undertaken in order to evaluate the possible impact of OCS activities on their feeding ecology. A total of 58 oldsquaw, black scoters, common murres and marbled murrelets were collected in Chiniak Bay between 23 and 25 February 1978. Their stomachs were examined and aggregate percent volume was calculated for each type of prey. Seabird collections were made between 2 April and 30 August 1978, in the Kodiak area. A total of 555 black-legged kittiwakes, tufted puffins, common murres, sooty and short-tailed shearwaters, marbled murrelets and pigeon guillemots was collected. Of these, 323 (58%) had digestible prey tissue in their stomachs. Offshore Continental Shelf activities which endanger the productivity of benthic invertebrate or epipelagic euphausiid and fish populations could have a significant negative impact on the feeding ecology of marine birds. Most of the seabirds studied are primarily piscivorous, consuming almost entirely capelin, sand lance, pollock and Pacific sandfish during the breeding season. Those which have more diverse diets (pigeon guillemots and wintering oldsquaw and black scoters) are dependent on sessile or slowly moving benthic forms which may be unable to avoid contact with contaminated water. (Sinha-OEIS)
W80-05048

POPULATION DYNAMICS AND TROPHIC RELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA AND SOUTHERN BERING SEA. PART 6: POPULATIONS AND ECOLOGY OF SEABIRDS OF THE KONIUJI GROUP, SHUMAGIN ISLANDS, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
R. A. Moe, and R. H. Day.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol II, Receptors--Birds, p 395-491, October 1979. 31 Fig, 38 Tab, 28 Ref, Addendum, NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Birds, *Ecology, *Food chains, *Breeding, Monitoring, Baseline studies, Water pollution effects, Environmental effects, Resources development, Alaska, *Outer Continental Shelf, Petroleum development, Alaska Peninsula.

This study of marine birds in the Shumagin Islands was one of several site specific studies of birds. The general purpose of the studies was to obtain information on birds necessary to evaluate the potential impacts of the proposed development of petroleum resources of the outer continental shelf and to provide baseline data for monitoring the effects of the development program. The Shumagin Islands were chosen as a study site because of the presence of large, diverse populations of marine birds that could be adversely affected by development in the Kodiak Basin or by tanker traffic from development areas in the Bering, Chukchi, or Beaufort Seas. In addition, the presence of large populations of small alcids was of interest because species in this group are highly vulnerable to marine pollution and were not adequately represented at other study areas. A notable feature of the colony distribution in the Koniuji Group is the concentration of breeding seabirds at the northern end of Big Koniuji and in the Koniuji Strait - Yukon Harbor area at the island's southeastern end. At each of these localities strong winds and tidal rips are prevalent, which are important mechanisms of nutrient-mixing in this greater availability of nutrients, support a large standing crop of euphisiids, which in turn support large seabird populations. (Sinha-OEIS)
W80-05049

POPULATION DYNAMICS AND TROPHIC RELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA AND SOUTHERN BERING SEA. PART 11: NOTES ON THE WINTER SEABIRDS OF CHINIAK BAY, KODIAK ISLAND, ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5B.
W80-05050

DISTRIBUTION, ABUNDANCE, COMMUNITY STRUCTURE AND TROPHIC RELATIONSHIPS OF THE NEARSHORE BENTHOS OF COOK INLET AND NEGOA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
H. M. Feder, and A. J. Paul.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol III, Receptors--Fish, Littoral, Benthos, p 1-30, October 1979. 44 Ref. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-03-5-022-56.

Descriptors: *Benthos, *Baseline studies, *Fisheries, *Water pollution effects, Oil spills, Clams, Crabs, Shrimp, Environmental effects, Resources development, Alaska, *Outer Continental Shelf, Gulf of Alaska, Cook Inlet, Petroleum development.

The long-term objectives of this study are: (1) a qualitative and quantitative inventory of benthic species within and adjacent to identified oil-lease sites in the northeast Gulf of Alaska (NEGOA) and lower Cook Inlet, (2) a description of spatial distribution patterns of selected species in the designated study areas, and (3) observations of biological interrelationships, specifically trophic interactions, between components of the benthic biota in designated study areas. Forty-two widely dispersed permanent stations for quantitative grab sampling have been established and these stations represent a reasonable nucleus around which a monitoring program can be developed. Infaunal invertebrates taken by van Veen grab in the northeast Gulf of Alaska have been used to comprehend station/species aggregations by cluster analysis. Preliminary groupings of stations into three basic clusters have been accomplished. The operations connected with oil exploration, production, and transportation in the Gulf of Alaska present a wide spectrum of potential dangers to the marine environment. Adverse effects on the marine environment of these areas cannot be quantitatively assessed, or even predicted, unless background data are recorded prior to industrial development. (Sinha-OEIS)
W80-05052

KEY ORGANISMS IN BENTHIC FOOD WEBS AND THEIR RELATIONSHIP TO IMPORTANT HABITATS IN LOWER COOK INLET,
Alaska Univ., Fairbanks. Inst. of Marine Science.
H. M. Feder, and A. J. Paul.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol III, Receptors--Fish, Littoral, Benthos, p 31-83, October 1979. 4 Fig, 17 Tab, 42 Ref, Append. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-03-5-022-56.

Descriptors: *Benthos, *Habitat, *Food webs, *Ecosystems, Water pollution effects, Monitoring, Baseline studies, Environmental effects, Oil pollution, Resources development, Crabs, Shrimps, Fisheries, Fish, Alaska, *Outer Continental Shelf, Gulf of Alaska, Petroleum development.

The snow crab (Chionoecetes bairdi) is a conspicuous member of the shallow shelf of lower Cook Inlet, and supports a commercial fishery of considerable importance. Food data for snow crab, king crab (Paralithodes camtschatica), Dungeness crab (Cancer magister), 9 species of shrimps, and 19 species of fishes are now available. The importance of deposit-feeding clams in the diet of king and snow crabs, and some bottom fishes is clear. It is suggested that comprehension of the relationship between oil, sediment, deposit-feeding clams, king and snow crabs is essential to understand the potential impact of oil on the latter two commercially important species. Initial assessment of all data suggests that sufficient station uniqueness exists to permit development of monitoring programs based on species composition at selected stations utilizing grab, dredge, and trawl sampling techniques; and adequate numbers of biologically well-known, unique, and/or large species are available to permit nomination of likely monitoring candidates once industrial activity is initiated. Benthic invertebrates (primarily the infauna, and slow-moving epifauna) are useful as indicator species for a disturbed area because they tend to remain in place, typically react to long-range environmental changes and, by their presence, generally reflect the nature of the sub-stratum. (Sinha-OEIS)
W80-05053

DISTRIBUTION, ABUNDANCE, COMMUNITY STRUCTURE AND TROPHIC RELATIONSHIPS OF THE NEARSHORE BENTHOS OF THE KODIAK SHELF,
Alaska Univ., Fairbanks. Inst. of Marine Science.
H. M. Feder, M. Hoberg, and S. C. Jewett.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol III, Receptors--Fish, Littoral, Benthos, p 84-207, October 1979. 5 Fig, 27 Tab, 72 Ref, 2 Append. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-03-5-022-56.

Descriptors: *Benthos, *Food webs, *Ecosystems, Water pollution effects, Baseline studies, Monitoring, Environmental effects, Oil pollution, Resources development, Crabs, Shrimps, Fisheries, Alaska, *Outer Continental Shelf, Kodiak Shelf, Petroleum development.

Until recently little was known about the biology of the invertebrates of the shallow, nearshore benthos of Kodiak Island. Since these invertebrates may be the ones most affected by petroleum operations in waters adjacent to Kodiak Island, baseline data on these species are essential before industrial activities begin there. The objective of this study was to assess distribution and relative abundance of epifaunal invertebrates in selected bays and offshore areas; and to determine the feeding habits of the principal inshore epifaunal invertebrate species, emphasizing king crabs, and selected bottom fishes. Thirty-nine permanent benthic stations were established in two bays - 25 stations in Izhut Bay and 14

stations in Kiliuda Bay. Initial assessment of data suggests that a few unique, abundant and/or large invertebrate species (king crab, snow crab, several species of clams) are characteristic of the bays investigated and that these species may represent organisms that could be useful for monitoring purposes. It is also suggested that a complete understanding of the benthic systems of Kodiak waters can only be obtained when the infauna is also assessed in conjunction with the epifauna. Based on stomach analyses, infaunal species are important food items for king and snow crabs. (Sinha-OEIS)
W80-05054

ENVIRONMENTAL ASSESSMENT OF SELECTED HABITATS IN THE BEAUFORT AND CHUKCHI LITTORAL SYSTEM,
Western Washington Univ., Bellingham.
A. C. Broad, A. Benedict, K. Dunton, H. Koch, and D. T. Mason.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol III, Receptors--Fish, Littoral, Benthos, p 361-542, October 1979. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-03-5-022-81.

Descriptors: *Littoral, *Benthos, *Ecosystems, *Food webs, *Carbon, Water pollution effects, Environmental effects, Baseline studies, Oil pollution, Resources development, Alaska, *Outer Continental Shelf, Beaufort Sea, Chukchi Sea, Petroleum development.

Except for the Stefansson Sound Boulder Patch, there is no known unique or unusual benthic habitat in the Beaufort, inshore or nearshore regions. The Stefansson Sound region is a biological habitat that, for practical purposes, may be considered unique and, at least until this community and its overall contribution to the Beaufort Sea are better known than now is the case, should not be disturbed. Carbon from detritus of terrestrial origin enters the Beaufort marine food web through Gammarus setosus and, possibly other species. The full importance of this contribution is yet to be evaluated, but there are implications for attempts at shoreline stabilization and, interference with currents that transport materials alongshore. Data indicate a relationship between the presence of peat and the abundance of benthos. Because development which may require shoreline stabilization and interference with longshore transport are imminent and because this same development may introduce into the marine environment materials that can affect the availability of detrital carbon to the marine biota, it is important that the extent of this contribution and the pathways by which it occurs are known at the earliest possible date. (Sinha-OEIS)
W80-05056

NUTRIENTS DYNAMICS IN NEARSHORE ALASKAN BEAUFORT SEA WATERS,
Alaska Univ., Fairbanks. Inst. of Water Resources.
D. M. Schell.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol V, Receptors--Microbiology, Contaminant Baselines, p 143-190, October 1979. 9 Fig, 5 Tab, 18 Ref. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado. NOAA-3-5-022-56.

Descriptors: *Productivity, *Aquatic life, *Carbon, *Nutrients, *Erosion, Environmental effects, Baseline studies, Water pollution effects, Oil pollution, Alaska, Resources development, *Outer Continental Shelf, Beaufort Sea, Nutrient cycles, Petroleum development.

The principal processes supplying energy (i.e. fixed carbon) to the biota of the Beaufort Sea coastal zone is described and related to the various nutrient chemistry regimes observed to this production of energy. The conclusions to date give evidence that the nearshore Beaufort Sea is decidedly different than more temperate Alaskan coastal zones with regard to the energy sources supporting the biota. The estimates of energy input to nearshore waters show that over 50% of the carbon input to nearshore marine biota (within approximately 10 km of shore) is terrestrially derived from two primary processes, fluvial transport and coastline erosion. The rivers carry large quantities of organic matter during spring break-up and coastal erosion occurs during summer months, resulting in the deposition of large amounts of organic carbon along the shoreline. This carbon is composed primarily of peat-like material that has been accumulating on land for up to 12,000 years. Thus the nearshore marine biome is apparently a 'fossil fuel' subsidized ecosystem wherein the meager annual primary production by ice algae and phytoplankton is supplemented by organic carbon eroded from coastal peat bluffs and transported by river flow into the coastal zone. The implications of oil and gas development are mostly indirect but potentially great. Development that would increase or decrease shoreline erosion or runoff characteristics could be expected to show corresponding impacts on the nearshore zone. (Sinha-OEIS)
W80-05060

COMPOSITION, TRANSPORT AND DEPOSITION OF SUSPENDED MATTER IN LOWER COOK INLET AND SHELIKOF STRAIT, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
R. A. Feely, J. D. Cline, G. Massoth, A. J. Paulson, and M. F. Lamb.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol V, Receptors--Microbiology, Contaminant Baselines, p 195-263, October 1979. 24 Fig, 8 Tab, 36 Ref. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Suspended solids, *Circulation, *Oil pollution, *Water pollution effects, Heavy metals, Trace elements, Baseline studies, Resources development, Alaska, *Outer Continental Shelf, Gulf of Alaska, Petroleum development, Crude oil.

Of particular concern are the major accidents which cause massive oil spills, however, chronic release of oil through minor spills and localized transfer operations may be more important over the long term. Since crude oil is sparingly soluble in seawater, it tends to form emulsions when introduced into marine waters, especially under intense wave action. The emulsions have a high affinity for particles and tend to be adsorbed rapidly. Recent studies of oil spills in coastal waters containing high suspended loads have indicated rapid dispersal and removal of the oil by sorption onto particles along frontal zones. These zones are regions where turbid brackish water contacts seawater. The seasonal distributions, elemental composition, and fluxes of suspended particulate matter in lower Cook Inlet were studied and compared with current patterns and bottom sediment distributions. In general, the suspended matter distributions appear to follow the pattern of circulation in lower Cook Inlet and Shelikof Strait. The inflowing clear saline Gulf of Alaska water, which is enriched in biogenic particles of marine origin, flows northward along the eastern coast until it reaches the region near Cape Ninilchik where it mixes with the outflowing brackish water. Comparison of suspended matter and sediment characteristics as well as regional sedimentation rates indicates that net sedimentation of suspended matter in the central basin of lower Cook Inlet is minimal. However, net sedimentation is occurring in the embayments along the coast. (Sinha-OEIS)
W80-05061

DISTRIBUTION AND ABUNDANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS AND SUSPENDED HYDROCARBONS IN COOK INLET, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5A.
W80-05062

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM GULF OF ALASKA, BERING AND BEAUFORT SEAS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W80-05065

NATURAL DISTRIBUTION AND ENVIRONMENTAL BACKGROUND OF TRACE HEAVY METALS IN ALASKAN SHELF AND ESTUARINE AREAS,
Battelle-Northwest Labs., Richland, WA.
D. E. Robertson, and K. H. Abel.
In: Environmental Assessment of the Alaskan Continental Shelf. Annual Reports of Principal Investigators for year ending March 1979. Vol V, Receptors--Microbiology, Contaminant Baselines, p 660-696, October 1979. 8 Fig, 13 Tab. NOAA, Environmental Research Laboratories, Outer Continental Shelf Environmental Assessment Program, Boulder, Colorado.

Descriptors: *Heavy metals, *Sediments, *Baseline studies, Water pollution effects, Resources development, Environmental effects, Estuaries, Manganese, Vanadium, Alaska, *Outer Continental Shelf, Petroleum development.

The projected recovery of crude oil from the Alaskan continental shelves carries with it the risk of altering this environment by physical perturbations or spillage of crude oil. Such disturbances could result in detrimental impacts on the natural cycling of trace heavy metals in the shelf environment. It is therefore necessary to determine predevelopment evaluations of the trace metal distributions and behavior in promising shelf areas so that any future contamination may be identified, quantified and assessed. The primary objective of this study was to determine environmental baseline concentrations of selected heavy metals in seawater (both dissolved and suspended fractions), in sediments, and in selected marine 'indicator organisms' of the Alaskan study area. The work reported for this period centers around the analyses of samples collected in Cook Inlet during participation in two field cruises on May 4-15, 1978 and August 25-September 5, 1978. The results of analyses of sediments from the Beaufort Sea, Chukchi Sea, Norton Sound and the Shelikof Strait are also reported as well as the analyses of vanadium in biota from various shelf areas. (Sinha-OEIS)
W80-05066

POLLUTION: INTERNATIONAL CONVENTIONS, FEDERAL AND STATE LEGISLATION,
For primary bibliographic entry see Field 6E.
W80-05072

FEDERAL WATER POLLUTION CONTROL ACT - THE FEDERAL GOVERNMENT'S EXCLUSIVE REMEDY FOR RECOUPMENT OF OIL SPILL CLEANUP COSTS,
For primary bibliographic entry see Field 6E.
W80-05073

LAND USE CONTROLS IN COASTAL AREAS,
Kentucky Univ., Lexington
For primary bibliographic entry see Field 6E.
W80-05075

INTERNATIONAL ENVIRONMENTAL PROTECTION: POLICY, LEGAL, AND TRADE ASPECTS.
For primary bibliographic entry see Field 6E.
W80-05077

5D. Waste Treatment Processes

THE APPLICATION OF PHYSICAL AND CHEMICAL PARAMETERS TO THE DESIGN OF RAISED BED SOIL ABSORPTION SYSTEMS,
J. R. Smyth, and J. D. Lowry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182033, Price codes: A06 in paper copy, A01 in microfiche. Maine Land and Water Resources Center University of Maine, Orono Project Completion Report, April 1980. 108 p, 12 Fig, 3 Tab, 115 Ref. OWRT A-040-ME(5).

Descriptors: *Sewage treatment, *Septic tanks, *Maine, *Optimization, Biochemical oxygen demand, Nitrogen, Pathogenic bacteria, Soil properties, Phosphorus, Oxidation-reduction potential, Denitrification, Absorption, Permeability, Domestic wastes.

The physical and chemical relationships involved in waste water treatment by raised bed soil absorption systems were quantified and improved design criteria for the treatment of nitrogen, phosphorus, organic carbon, and bacteria and viruses were developed. Study conditions were tailored to those found in Maine where approximately 50% of households are not linked to municipal sewage systems and as little as 15% of the land can accommodate conventional soil absorption systems. For each of the study pollutants, ammonium-nitrogen, nitrate-nitrogen, phosphorus, organic carbon, and bacteria and viruses, transport and retention in soils was investigated and these results were combined with field results from two systems in Maine to design optimum systems for each pollutant. Waste water production was estimated at 189 liters/capita/day for design purposes. Parameters considered for each design included pH, moisture content, temperature, redox potential, loading rate, soil texture, and soil composition. Results show that the only long term treatment for the removal of nitrogen is nitrification followed by denitrification. It is difficult to achieve substantial denitrification in a raised bed system but a nitrification/denitrification system is proposed. Chemical adsorption and precipitation were found to effectively remove phosphorus in raised bed systems. While all of the optimum designs are not compatible, a mutually satisfactory raised bed design is possible. (Seigler-IPA)
W80-04810

WASTE WATER FOR CROP IRRIGATION.
For primary bibliographic entry see Field 3C.
W80-04842

PROCEEDINGS OF A WORKSHOP ON ALTERNATIVE WASTEWATER TREATMENT SYSTEMS AT URBANA-CHAMPAIGN, ILLINOIS, JUNE 12-13, 1979.
Water Resources Center University of Illinois at Urbana Special Report No 10, August 1979. 150 p. 40.038, 79/20.

Descriptors: *Waste water treatment, *Conferences, *Illinois, *Alternative waste-water treatment, *Innovative treatment, *On-site management districts, *On-site treatment systems, *Wastewater disposal, 1977, Clean Water Act, Clustered treatment systems, Consulting engineers, Cost-benefit analysis, Treatment facilities, Funding, Land application-sludge, Land application-wastewater, California, Pressure sewers, Sewage disposal, Public participation-Illinois, Septic tanks, Wastewater Disposal Zone Act-Illinois.

The purpose of the workshop was to instruct consultants, local officials, and state agency personnel in the state of the art of alternative wastewater-treatment systems, including funding and institutional aspects. The workshop consisted of presentations by speakers from governmental agencies, universities, and consulting firms on the design of alternative systems, cost effectiveness, and the state and federal laws that apply. The workshop was divided into three parts: Policy and Regulations, Alternative and Innovative Systems, and Institutional Aspects.
W80-04936

JUDICIAL REVIEW UNDER FEDERAL POLLUTION LAWS,
Chicago Univ., IL.
For primary bibliographic entry see Field 6E.
W80-04996

THE UTILIZATION OF A FRESH-WATER WETLAND FOR NUTRIENT REMOVAL FROM SECONDARILY TREATED WASTE WATER EFFLUENT,
Michigan Univ. Ann Arbor. Dept. of Chemical Engineering.
D. L. Tilton, and R. H. Kadlec.
Journal of Environmental Quality, Vol 8, No 3, p 328-334, July-September 1979. 9 Fig, 6 Tab, 20 Ref. NSF AEN 75-08855.

Descriptors: *Nutrient removal, Plant growth, *Wastewater treatment, *Wetlands, *Houghton Lake(MI), Nitrogen, Nitrates, Nitrites, Phosphorus, Hydrology, Waste disposal, Sewage treatment, Sewage disposal, Waste dilution, Waste assimilative capacity, Effluents, Ammonia, Cattails, Discharge(Water).

Secondarily treated waste water applied to a freshwater wetland southwest of Houghton Lake, Michigan 1976-1977, showed that this wetland system was highly efficient in reducing dissolved nutrients. Although long-term vegetation changes are difficult to predict, annual effluent discharges into Houghton Lake wetland will probably favor plant species associated with wetter and more nutrient-rich conditions. Between May and September 1976, effluents were discharged with outlets every 9 m over a 200 m distance. Mean flow rate was 15.8 cu m/d; water depths were 12 cm at the pipeline. Prior to pumping, nitrate and nitrite concentrations were <0.01 mg/l at 25 m from the pipeline and remained at this level during discharge. Nitrogen averaged 0.36 mg/l in the effluent. Ammonium concentrations in the treated waste water were rarely greater than concentrations in wetland surface waters. Total dissolved phosphorus (TDP) concentrations averaged 0.01 mg/l prior to discharges. TDP averaged 0.41 mg/l in the effluent and 0.11 mg/l at sampling stations 25 m from the discharge. In 1977 a point-source distribution system was used. Effluent concentrations averaged 1.50 mg nitrate/l and 1.57 mg TDP/l. Within 30 m nitrate was 0.10 mg/l and within 80 m TDP was 0.07 mg/l in surface waters. Biomass, including live plants, standing dead plants and litter was not significantly different among sampling stations. However, Typa (cattail) dimensions were larger in the discharge area; maximum leaf length was 170 cm within 6 m of the pipeline compared to 145 cm 50 m from the discharge. (Danovich-Wisconsin)
W80-05033

5E. Ultimate Disposal Of Wastes

DEVELOPMENT OF ANIMAL WASTE FACILITIES FOR MINIMIZING WATER POLLUTION,
South Dakota State Univ., Brookings. Water Resources Inst.
J. L. Wiersma.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-181357, Price codes: A04 in paper copy, A01 in microfiche. Project Completion Report, March 1980. 68 p, 33 Fig, 5 Tab. OWRT A-036-SDAK(1).

Descriptors: *Feed lots, *Cattle, *Farm wastes, *Water pollution sources, Terracing, Agricultural runoff, Farm management, Feeds, Livestock, Decomposing organic matter, Water pollution, Groundwater, Confinement pens, South Dakota, Fertilization.

Three methods for controlling water pollution from animal wastes in feedlots are presented. The first method involves confining all wastes and water to the feedlot area until maximum decomposition occurs. A feedlot was designed to completely eliminate runoff and percolation thus creating a solids-liquid ratio on the surface to promote rapid decomposition. The lot had a dish shaped porous surface on a sand bed with imbedded collector drains. Perforated steel matting was used for the surface. This original design did not work well as cattle wastes and hair formed a nearly impermeable layer on the sand. The use of the sand filter was abandoned but the use of the perforated steel matting proved positive. The second method involved the use of a minimum area for the feedlot to favor decomposition and treatment of wastes. A system of diversion ditches and drying terraces was used to handle runoff and wastes from a sloped lot. Sample wells were used to study groundwater flow and quality near the terraces. General groundwater quality in the vicinity of the terraces was poor, however, results indicate that the drying terraces were not the cause of the poor quality. The third method involves the return of feedlot wastes to the land at a rate that does not inhibit full crop production. Factors that must be considered include climate, wastes, soils, crops, rotations, manure nitrogen content, and cattle feed type. Due to the lack of sufficient funding only preliminary results and conclusions were made for this method. (Seigler-IPA)
W80-04811

5F. Water Treatment and Quality Alteration

THE SELECTIVE REMOVAL OF NITRATE AND NITRITE FROM POLLUTED WATERS,
Kansas State Univ., Manhattan. Dept. of Chemistry.
W. C. Danen, and C. E. Meloan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180771, Price codes: A02 in paper copy, A01 in microfiche. Kansas State University Project Completion Report, April 1, 1980. Kansas Water Resources Research Institute. 19 p, 8 Tab, 18 Ref. OWRT A-079-KAN(1), 14-34-0001-8018.

Descriptors: *Nutrient removal, Methodology, *Nitrates, *Nitrites, Pollution, Ion-selective polymers, Water, Polyvinylbenzyl chloride, Nitron, Polyvinylbenzylnitron chloride, *Insoluble polymers, Toxicity, Methemoglobinemia, Ion-exchange polymer, Polymer-supported reagents.

The objective of the research project was to synthesize an insoluble polymer to remove nitrate and nitrite from water. A high capacity nitrate- and nitrite- selective polymer was synthesized by attaching nitron to commercial polyvinylbenzyl chloride (60/40 ortho/para isomers). The capacity of this polymer to remove nitrate and nitrite from 10 to the minus third power M solution was 67% and 42%, respectively. The compound 1-phenyl-2-diethylaminoethyl-4'-aminobenzoate was also synthesized and attached to commercial polyvinylbenzyl chloride (60/40 ortho/para isomers). The nitrate and nitrite selectivity of this polymer was realized and the capacity of this polymer to remove nitrate and nitrite from aqueous solution was 76% and 65.6%, respectively. 2-Diethylaminoethyl-4'-nitrobenzoate hydrochloride was synthesized but exhibited no tendency to complex/precipitate nitrate. Two other compounds, 1-(4'-nitrophenyl)-2-diethylaminoethyl-4''-nitrobenzoate hydrochloride and 1-(4'-aminophenyl)-2-diethylaminoethyl'4''-aminobenzoate hydrochloride, were synthesized and their abilities to precipitate nitrate from aqueous solution were compared to that of the nonsubstituted ester; the nitro-substituted compound was shown to be most efficient. Thus, a polymer was synthesized by attachment of 1-(4'-nitrophenyl)-2-diethylaminoethyl-4''-hydroxybenzoate to polyvinylbenzyl chloride (60/40 ortho/para isomers). The capacity of this polymer to remove nitrate and nitrite from aqueous solution was 80% and 68%, respectively. All of the synthesized polymers could be easily regenerated without loss of capacity and used repeatedly providing a possibility for commercial development.
W80-04869

SMYRNA, DELAWARE SOLVES A WATER PROBLEM,
Delaware Div. of Public Health, Dover. Office of Water Supply.
M. Joyce.
Water and Sewage Works, Vol 127, No 3, p 32, 42, March, 1980. 1 Tab, 13 Ref.

Descriptors: *Ground water, *Municipal water, *Water pollution treatment, *Aeration, Delaware, Water supply, Activated carbon, Organic wastes, Carcinogens.

A U.S. EPA organics monitoring survey detected trichloroethylene (TCE) in the municipal water system of Smyrna, Delaware. The town issued a public notice which recommended that all water used for drinking or cooking be boiled. Also, plans were made to either tap another aquifer or treat and monitor the contaminated aquifer. Since the contaminated levels were not abating and the source remained undetermined, it was decided to use TCE-removal techniques for the existing system. Granular activated carbon (GAC) was excluded due to its high cost. Aeration was used successfully to remove TCE. (Purdin-NWWA)
W80-04923

A RATIONAL APPROACH TO UTILIZATION OF CARBON BEDS IN REDUCING MICROORGANIC CONTAMINATION IN DRINKING WATER,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
F. A. DiGiano, W. H. Frye, and C. W. Baxter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182789, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Center, University of Massachusetts Publication No 109, 1980. 113 p, 42 Fig, 12 Tab, 39 Ref, 2 Append. OWRT A-091-MASS(1), 14-34-0001-6022.

Descriptors: *Activated carbon, *Water treatment, *Potable water, *Adsorption, *Fixed bed adsorbers, *Organic contaminants, *Drinking water treatment, Competition, Kinetics, Multi-component adsorption, Ideal adsorbed solution theory, Adsorption models, Methodology.

In the near future, granular activated carbon (GAC) adsorption beds will become more frequently used in water treatment for control of specific organic contaminants of concern to public health, e.g., the trihalomethanes and other low molecular weight chlorinated compounds. The problem of predicting GAC performance when a complex mixture of trace organics is present has not been solved. This research examined the anomalous, competitive adsorption of a specific organic compound, o-cresol, in the presence of acetophenone and in the presence of acetophenone and veratrole. Several competitive equilibrium models were used to no avail in explaining the reversal of expected preference for adsorption sites. The importance of considering adsorption rate in addition to adsorption equilibrium was demonstrated. The o-cresol adsorbed much more slowly than the other components, even though they all have very similar molecular diffusivities. Apparently, the form of the adsorbing species, solid vis-a-vis liquid, influenced adsorption kinetics. A small differential carbon contactor was demonstrated to provide a convenient means of screening the breakthrough behavior of mixtures of organic compounds. This rapid data gathering technique could be used in lieu of, or in addition to, mathematical models, especially when anomalous behavior is suspected. (Godfrey-Mass)
W80-05013

SELF-PURIFICATION OF RIVERS A TWO-PHASE MODEL FOR BACTERIAL BIODEGRADATION,
Centre Belge d'Etude et de Documentation des Eaux, Liege.
F. Edeline, and G. Lambert.
Water Research, Vol 13, No 6, p 473-480, 1979. 8 Fig, 20 Ref.

Descriptors: *Bacteria, *Self-purification, *Rivers, *Biodegradation, *Mathematical models, *Substrates, *Kinetics, Oxygen, Equations, Population dynamics, Monod equation, Oxygen sag, Chemical oxygen demand, Metabolism, Michaelis-Menten equations, Theoretical analysis, Waste assimilative capacity, Water pollution, Water pollution control.

A simple two-phase model accounts for 95% of total oxygen consumption during the bacterial phase of river self-purification. The two phases are characterized by a logistic model: phase one corresponds to a destruction of most substrate and formation of cellular reserves; phase two consumes these stored substances when external substrate is less attractive than endogenous reserves. The model is theoretically based on several well-established laws; it is restricted to the truly bacterial process, starting when pollutants are added and ending at the plateau value. Monod equations are used for bacterial dynamics. Validity of these theoretical equations is checked by oxygen sag curves. The total metabolized substrate is given by the difference between initial COD and plateau COD values. Five typical results are obtained with municipal sewage as substrate and river water as seeding. Biological zero is obtained after 31.5 h, irrespective of pollutant load. During the second phase as external substrates decrease and internal substrates increase, an equilibrium point occurs where both are equally available to cells. Experimental results show that the kinetic constant for external substrate metabolization is extremely sensitive to toxic or inhibitory influences and varies widely. The kinetic constant for endogenous respiration is fairly constant at 0.30-0.35. The proportion of external substrate converted into stored substances is not truly a constant but varies between narrow limits centered around 15%. (Danovich-Wisconsin)
W80-05028

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN TRANSFORMATIONS IN SIMULATED LAKE SEDIMENT-WATER SYSTEMS,
Wisconsin Univ. Madison. Dept. of Soil Sciences.
For primary bibliographic entry see Field 5C.
W80-05031

SALINITY ASPECTS OF THE COLORADO RIVER AGREEMENT,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 6E.
W80-05093

5G. Water Quality Control

SETTLEABILITY OF URBAN RUNOFF POLLUTION,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
W. Whipple, Jr., and J. V. Hunter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182017, Price codes: A02 in paper copy, A01 in microfiche. Partial Completion Report, April 1980, 19 p, 10 Fig, 12 Ref. OWRT A-058-NJ(1), 14-34-0001-0132.

Descriptors: *Water pollution control, Water pollution, Pollution, Heavy metals, Oil pollution, Organic wastes, *Storm runoff, Coliforms, *Sediment control, Sediment, *Detention reservoirs, Storm water, *Settling basins, Urban runoff, *Storm water management, Dual purpose detention basins, *Settleability of pollutants.

Because of the growing interest in stormwater management, and particularly of the possibility of using detention basins for removing particulate pollution, it is important to determine the effectiveness of such basins for removal of various polluting substances. In the study reported upon, samples of urban runoff were allowed to settle in a large tube, and the quantity of each pollutant settling in a given time period determined. There was more variability in rate of settlement of specific pollutants than for total suspended solids. Lead and hydrocarbons settled out 60-65% in 32 hours, only slightly slower than total suspended solids. BOD and copper were removed at somewhat lower rates, and zinc even lower. Coliform counts were reduced by an order of magnitude. These results indicate the probable effectiveness of retention of stormwaters in removing particulate pollutants. The use of dual prupose detention basins, required to be built by developers as a condition of developing the land, is the only feasible means which has been found to prevent further increases in nonpoint source pollution in urbanizing areas. These concepts are now being applied in municipalities, counties and substate regional agencies.
W80-04807

A ONE-DIMENSIONAL, STEADY-STATE, DISSOLVED-OXYGEN MODEL AND WASTE-LOAD ASSIMILATION STUDY FOR SILVER CREEK, CLARK AND FLOYD COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W80-04861

REGULATION OF WATER POLLUTION FROM AGRICULTURAL POINT SOURCES IN NEBRASKA: IMPACT OF THE NPDES PERMIT PROGRAM ON FEEDLOT OPERATIONS,
For primary bibliographic entry see Field 6E.
W80-04925

OIL SPILLS: A PUBLIC OFFICIAL'S HANDBOOK,
State Univ. of New York Coll. at Potsdam. Dept. of Anthropology.
For primary bibliographic entry see Field 5C.
W80-04938

OIL SPILLS: A COASTAL RESIDENT'S HANDBOOK,
State Univ. of New York Coll. at Potsdam. Dept. of Anthropology.
For primary bibliographic entry see Field 5C.
W80-04939

PROTECTING AQUIFERS FOR THE FUTURE.
For primary bibliographic entry see Field 6F.
W80-04948

ACID MINE DRAINAGE AND THE PENNSYLVANIA COURTS,
Duquesne Univ. of the Holy Ghost, Pittsburgh, PA. School of Law.
For primary bibliographic entry see Field 6E.
W80-04966

FEDERAL CONTROL OF WETLANDS: THE EFFECTIVENESS OF CORPS' REGULATIONS UNDER SECTION 404 OF THE FWPCA,
For primary bibliographic entry see Field 6E.
W80-05005

SHIFTING EMPHASIS TO GROUND WATER,
Water Pollution Control Federation, Washington, DC.
P. J. Piecuch.
Journal Water Pollution Control Federation, Vol 52, No 3, p 441, March, 1980.

Descriptors: *Water pollution control, *Ground water, Regulations, Waste water treatment, Waste water disposal, Surface water, Water quality, Potable water.

The EPA is shifting its emphasis on water quality activities from surface water to ground water. This is due to the fact that 50% of urban residents and 95% of rural residents rely on ground water for potable purposes, and ground water supplies are 50 times greater than annual surface water flows in the U.S. Existing data on ground water quality are inadequate in the face of potential threats from pollution sources. As part of the EPA's National Ground Water Strategy, task groups have been formed, workshops have been set, strategy papers

will be published, and public hearings will be held. This change of emphasis is likely to cut across a wide range of regulatory programs and involve a shift from corrective measures such as effluent treatment to preventive measures, which is probably the only way to attack the ground water problem. (Purdin-NWWA)
W80-05059

BACTERIA: WHAT'S IN THE WATER.,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8A.
W80-05064

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

COASTAL ZONE MANAGEMENT FROM AN ADMINISTRATIVE PERSPECTIVE: A CASE STUDY OF THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 6E.
W80-04919

IDENTIFYING AND MEETING TRAINING NEEDS FOR PUBLIC PARTICIPATION RESPONSIBILITIES IN WATER RESOURCES PLANNING,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 9B.
W80-05015

NEW NATIONWIDE HYDROLOGIC INVESTIGATIONS.
Ground Water Age, Vol 14, No 7, p 21-24, 40, 42, March, 1980. 1 Fig.

Descriptors: *Regional analysis, *Ground water resources, *Investigations, Hydrologic data, Aquifer systems, Aquifer management, Planning, Withdrawal, Computer models, Water quality, Forecasting, Economics.

Large supplies of ground water will be required in the coming decade for municipal, agricultural and industrial supplies. This may result in lowering ground water levels, degradation of water quality, and land subsidence. The understanding of the natural flow system and of the way in which it will respond-hydraulically, chemically, and structurally-to imposed stresses, is a necessary prerequisite to groung water development planning. To provide information on a regional scale, the U.S. Geological Survey has initiated a new series of hydrologic investigations--The Regional Aquifer System Analysis (RASA) Program. This program represents a systematic effort to study twenty-nine regional aquifers which cover much of the country and represent most of the national water supply. For interconnected aquifers, the study objective will be to define the regional hydrology and establish a framework-geologic, hydraulic, and geochemical-for detailed local studies. For systems composed of independent aquifers, the study objective will be to establish common principles governing the occurrence, movement and quality of ground water in the individual units. Every project will use computer models to analyze existing hydrologic regimes and provide predictive capabilities to estimate effects of future development. (Purdin-NWWA)
W80-05099

6B. Evaluation Process

RELIABILITY OF CYCLIC SURFACE AND GROUNDWATER STORAGE SYSTEMS FOR WATER SUPPLY: A PRELIMINARY ASSESSMENT,
Washington Univ., Seattle. Charles W. Harris Hydraulics Lab.
D. P. Lettenmaier, and S. J. Burges.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180870, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No 64, November 1979. 70 p, 14 Fig, 8 Tab, 27 Ref. OWRT A-097-WASH(2).

Descriptors: *Model studies, *Water storage, *Reservoir storage, *Aquifer systems, Groundwater recharge, Pumping, Inflow water balance, Synthetic hydrology, Cost analysis, Feasibility studies, Markov processes, Mathematical studies, Stream flow.

A simplified cyclic water resources system involving a single surface reservoir and an adjacent storage aquifer was modeled and evaluated both physically and economically. If fixed annual water demand cannot be met by annual inflows to the surface reservoir, pumpage from the aquifer is used to supply the deficit. The aquifer is recharged by surface reservoir release during periods of reservoir inflow in excess of storage capacity. Parameters used to assess physical performance include indices of aggregate system supply deficits, pumping requirements, and the frequency of limitation situations such as empty or full aquifer, empty or full surface reservoir, and pumping or recharge equal to capacity. For the economic analysis a 40 year project life was assumed. Thirty-two physical and streamflow parameter combinations were used with the empirical cumulative distribution function of 18 performance measures to generate data. Recharge and pumping capacities were set to relatively large values so that system performance was generally governed by the combined storage capacity. For the situations modeled, pumpage from the aquifer was able to prevent system failure when surface supplies were not adequate. The least cost system was found to be one with the minimum surface storage needed to provide reliability for the system. Providing buffering against variations in stream flow by aquifer storage cost approximately an order of magnitude less than providing surface storage. (Seigler-IPA)
W80-04878

CULTURAL RESOURCE SURVEY AND TESTING AT THE MCGEE CREEK PROJECT, OKLAHOMA,
Environmental Assessments, Inc., Pauls Valley, OK.
P. McGuff.
Report, February 1980. 569 p, 83 Fig, 86 Tab, 19 Ref, 6 Append. 8-07-50-VO171.

Descriptors: *Surveys, *Archaeology, *Oklahoma, *History, *Dating, Land use, Population, Reservoirs, Erosion control, Project planning, McGee Creek Project.

An archaeological survey of the McGee Creek Project area in 1978 identified 435 localities of cultural activity of which 49 were evaluated and tested to develop approaches for reducing project related damage to the sites. The dam and reservoir for the project will involve 11,040 acres in southeastern Atoka County in Oklahoma. A brief history of the area is given. The area was once part of the Caddoan culture area that became sparsely settled by Old World people before it became Choctaw and Chickasaw land from 1830 to 1889. Early white settlers than came in mostly from the south. In general the area has been exploited for its resources and farming is not practical except on a very restricted basis. Parts of the project area were surveyed more intensly than others depending on the amount of destruction expected. A maximum interval of 20 meters was used for parallel survey transects. Site information collected and recorded included cultural affiliation, horizontal extent, vertical extent, physiographic location, condition, environmental placement, and potential significance. Three categories of sites were identified, 219 prehistoric, 52 historic, and 72 modern. It is recommended that a mitigation program be developed to sample 10% of the cultural fill at worthy prehistoric and historic sites and to study erosion at these sites and the possibility of constructing inhibitors to protect these sites from erosion. (Seigler-IPA)
W80-04881

THE CLEAN WATER ACT: UNEXPECTED IMPACTS ON INDUSTRY,
For primary bibliographic entry see Field 6E.
W80-04914

COASTAL ZONE MANAGEMENT FROM AN ADMINISTRATIVE PERSPECTIVE: A CASE STUDY OF THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 6E.
W80-04919

SOME IMPLICATION OF OCEAN RESEARCH,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6E.
W80-04975

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A PRELIMINARY FEASIBILITY STUDY TO IRRIGATE WESTERN UMATILLA AND NORTHEASTERN MORROW COUNTIES, OREGON,
Oregon Dept. of Water Resources, Salem.
For primary bibliographic entry see Field 6G.
W80-05017

6D. Water Demand

NEW MEXICO'S NATIONAL FORESTS AND THE IMPLIED RESERVATION DOCTRINE,
For primary bibliographic entry see Field 6E.
W80-04989

ADMINISTRATIVE WATER RIGHTS INSPECTIONS IN CALIFORNIA,
For primary bibliographic entry see Field 6E.
W80-05000

A PRELIMINARY FEASIBILITY STUDY TO IRRIGATE WESTERN UMATILLA AND NORTHEASTERN MORROW COUNTIES, OREGON.
Oregon Dept. of Water Resources, Salem.
For primary bibliographic entry see Field 6G.
W80-05017

6E. Water Law and Institutions

THE CLEAN WATER ACT: UNEXPECTED IMPACTS ON INDUSTRY,
C. J. Koch, and R. A. Leone.
The Harvard Environmental Law Review, Vol 3, p 84-111, 1979.

Descriptors: *Economic impact, *Cost analysis, *Federal Water Pollution Control Act, *Industrial production, Industries, Decision making, Legislation, Costs, Federal government, Administrative agencies, Water pollution control, Economics.

The possible unanticipated economic and political consequences of water pollution controls imposed by the 1972 Clean Water Act on the tissue paper industry are examined. Analyzed in detail are the economics of regulation. It is suggested that as a direct result of governmental regulation a differential in the industry compliance cost curve will exist. This impact on the compliance cost curve may raise problems of economic equity among competing producers and between producers and consumers. The imposition of water pollution controls on the tissue industry has reduced the number of plant closings, and actually extended the life of existing plants. This is primarily based on the rationale that new capacity has higher abatement

costs than existing capacity. Given the compliance cost curve's importance, the likelihood that the federal Environmental Protection Agency would undertake a conscious policy of manipulating or managing its shape is examined. This could be effectuated by enacting a policy of leniency for high-cost abaters, with consumers as the primary beneficiaries. The analysis concludes that a conscious policy of curve shaping is unlikely due to legal constraints and resource limitations. (Schwerer-Florida)
W80-04914

ANNUAL REVIEW OF ACTIVITIES - 1975: WATER RESOURCES COMMITTEE, ARIZONA.
American Bar Association, Washington, DC. Natural Resources Section.
Natural Resources Lawyer, Vol 9, No 2, p 319-53, 1976.

Descriptors: *State governments, *Legislation, *Judicial decisions, *Water rights, Administrative agencies, Water law, Environmental effects, Legal aspects, Federal jurisdiction, Water pollution control, Water policy.

In Arizona bills were introduced providing for county water conservation districts. Two suits involving groundwater uses were filed on behalf of the Papago Indians. In California, Appellate Courts issued important decisions in two groundwater cases and touched upon the delicate area of federal-state relations. In Colorado, the important cases dealt with the adjudication of water rights, disputes over ownership, and Denver's delivery of water outside it political boundaries. The important state water legislation concerned tabulation of adjudicated water rights, condemnation of water rights by municipalities, water supply, definition of different types of pollutant discharges, and classification of permits. In Idaho, the Idaho Supreme Court ruled that the United States must quantify all of its reserved water rights. In Maine, the legislature enacted legislation limiting or prohibiting the anchorage of oil carrying vessels in Maine coastal waters. In New Mexico, the legislature established the framework for water research, conservation and development projects. In Oregon, the offices of the State Engineer and the Water Resources Board were combined. In Utah, legislation was proposed which would change enacting Utah's appropriation system. (Wilson-Florida)
W80-04915

BOUNDARY DELIMITATION IN THE ECONOMIC ZONE: THE GULF OF MAINE DISPUTE.
Maine Law Review, Vol 30, No 2, p 207-245, 1979. 10 Fig.

Descriptors: *Canada, *United States, *Law of the sea, *Boundary disputes, Political aspects, Boundaries(Surface), Oceans, International law, Jurisdiction, Continental shelf, International waters.

The realities of randomly concentrated and limited resources, complicated by the political geography of the oceans, have made maritime boundary delimitation a crucial international issue. Maine boundary delimitation falls into three broad categories. First is the drawing of baselines along a coast that will close off a nation's internal waters. Second, is the seaward limit of the various marine zones of national jurisdiction. The third is the international maritime boundary between adjacent and opposite states. A three-part analytical process is presented in the delimitation of international boundaries in the economic zone. First, the legal history of boundary delimitation in other marine zones is reviewed. Second, current proposals for economic zone boundary delimitation at the Third United Nations Conference on the Law of the Sea are analyzed. Finally, an assessment is given of the current economic zone boundary dispute between the United States and Canada in the Gulf of Maine. (Wilson-Florida)
W80-04916

EFFICIENCY IMPACTS OF COST SHARING ON SHORELINE MANAGEMENT,
National Bureau of Standards, Washington, DC.
H. E. Marshall.
Coastal Zone Management Journal, Vol 2, No 4, p 369-382, 1976. 3 Tab.

Descriptors: *Cost-sharing, *Shore protection, *Flood protection, Conservation, Shores, Protection, Programs, Beach erosion, Federal government, Management.

The nation's shorelines are being eroded by high winds and waves. As man continues to settle upon and develop on the ocean and Great Lakes shorelines, the concern over protection against human injuries and property damages from high winds and waves increases. Non-federal interests have traditionally received federal help in the form of cost-sharing for protective structures. Existing and alternative cost-sharing rules for shoreline protection are compared on the basis of economic efficiency. Both engineering and management techniques are examined for beach erosion, hurricane and emergency coastal flood protection. The present cost-sharing system appears to influence local interests to choose costly techniques of protection, engineering rather than management techniques, and under certain conditions, inefficient and overbuilt protective structures. These biases could be reduced if all engineering and management techniques for reducing shoreline damages were subject to the same percentage cost-sharing rules. (Daniels-Florida)
W80-04917

FEDERAL CONSISTENCY AND STATE EXPECTATIONS,
W. C. Brewer, Jr.
Coastal Zone Management Journal, Vol 2, No 4, p 315-325, 1976.

Descriptors: *Coasts, *Shore protection, *Zoning, Federal government, Land management, Programs, Administrative agencies, Legislation, Regulation, State government, Management.

The 1972 Coastal Zone Management Act requires federal projects be consistent with approved state coastal management programs. This is an important incentive for states to complete their programs. There are state obligations also. As a condition of program approval, states must first consult with the federal agencies concerned and provide opportunity for comment to avoid conflicts. This mechanism protects the federal agencies' interests. States must also give adequate consideration to the national interests involved in the siting of facilities necessary to meet non-local requirements. The federal consistency requirement is subject to various exceptions whose scope remains undetermined. One such uncertain exception is the exclusion from the coastal zone of federal lands 'the use of which is subject solely to the sole discretion ... of the federal government....' Despite these uncertainties, the consistency provision represents a major change in federal policy, which has traditionally allowed federal agencies to operate largely without concern for state land or water use requirements. (Daniels-Florida)
W80-04918

COASTAL ZONE MANAGEMENT FROM AN ADMINISTRATIVE PERSPECTIVE: A CASE STUDY OF THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION,
Texas A and M Univ., College Station.
G. C. Swanson.
Coastal Zone Management Journal, Vol 2, No 2, p 81-102, 1975. 1 Fig, 3 Tab.

Descriptors: *California, *Coasts, *Project post-evaluation, *Shore protection, Legislation, Management, Conservation, Development, Regulation, Planning, California, Resources development, Administrative agencies.

Competent administration of the 1972 Coastal Zone Management Act (Act) must proceed on an informed understanding of the organizational styles and capacities of agencies presently dealing with similar problems. One such agency is the San Francisco Bay Conservation and Development Commission, the forerunner of the California model of coastal management. An analysis of this model can shed light on what can be expected administratively as the Act becomes an operational reality. The major administrative insights offered fall into the following areas: (1) effectiveness assessment - the Commission's success can be systematically defined and measured, with important implications for coastal resource management; (2) organizational success - the Commission's administrative style can be analyzed in terms of the synergy which has been created between its organizational structure and decision-making process; and (3) implications of agency success - the Commission's most valuable lessons can be identified and applied to other situations. (Wilson-Florida)
W80-04919

COASTAL LAND USE CONTROL IN SWEDEN,
San Diego Univ., CA. School of Law.
R. G. Hildreth.
Coastal Zone Management Journal, Vol 2, No 1, p 1-29, 1975. 6 Fig.

Descriptors: *Foreign countries, *Coasts, *Shore protection, *Land use, State governments, Development, Legislation, Regulation, Conservation, Environmental control, Building codes, Public rights.

Several states in the United States recently adopted some form of special control over coastal land use, stimulated in part by the 1972 federal Coastal Zone Management Act (Act). Under the Act, 30 states are eligible for grants to assist them in developing and administering such coastal land use controls. In Sweden, such controls have been greatly expanded by recent amendments to existing legislation. Regulation of coastal land use occurs at all levels of government in Sweden. Prior to the adoption of legislation, Swedish customary law provided a limited form of coastal land use control. The 1952 Shoreline Act was enacted to implement and perpetuate this body of law. The 1964 Nature Conservacy Act gave Swedish counties the power to declare protected zones, in which building permits were required. Other Swedish legislation includes the Environment Protection Act, the Building Act, and the Expropriation Act. Recent amendments to these acts decrease the compensation due coastal landowners for restrictions placed on the use of their property and increase the specificity in the planning processes for coastal areas. These techniques are relevant to coastal zone management in the United States. (Wilson-Florida)
W80-04920

SHORELINE DEVELOPMENT CONTROLS AND PUBLIC ACCESS TO THE OCEAN'S EDGE,
California Coastal Zone Conservation Commission, San Francisco.
T. Crandall.
Coastal Zone Management Journal, Vol 1, No 4, p 451-466, 1974. 6 Fig, 1 Tab.

Descriptors: *California, *Shore protection, *Land development, Land use, Resources development, Recreation, Coasts, Local governments, Aesthetics, Public benefits, Environmental control.

The San Diego Coast Regional Commission is faced with the responsibility of approving, approving with conditions, or denying permits for development proposed along the scenic coastal bluffs of San Diego County. It has adopted guidelines for bluff-top development which assure retention of scenic vistas and public access, while permitting private landowners reasonable use of their property. These unique guidelines delineate certain environmental and aesthetic parameters within which bluff-top development may take place. The four major guidelines require development to: (1) enhance the overall appearance of the coastal bluff area, by encouraging the use of landscaping and exterior building materials that complement the natural form, texture and color of the coastal bluffs; (2) preserve adequate vista corridors

through each coastal bluff-top project; (3) provide public access from the nearest public street to and along the bluff edge; and (4) preserve the coastal bluff face in its natural condition. An integral part of the commission's guidelines was landscape criteria designed to ensure the continued attractiveness of coastal bluffs. The bluff-top guidelines have been accepted as reasonable by developers. (Wilson-Florida)
W80-04921

ESTUARINE SANCTUARIES - THE OREGON EXPERIENCE,
J. F. Ross, and D. L. Hepp.
Coastal Zone Management Journal, Vol 1, No 4, p 433-446, 1974. 4 Fig, 1 Tab.

Descriptors: *Oregon, *Estuaries, *Shore protection, Legislation, Estuarine environment, State governments, Coasts, Resources development, Ecology, Estuarine fisheries, Environmental control.

In response to the growing recognition of the critical importance of estuaries and the intense pressure to change them, the Coastal Zone Management Act established a program to assist states in long-term protection of selected natural estuarine areas. A nationwide system of estuarine sanctuaries will be created to preserve, for research and education, areas respresentative of each of the major biogeographical estuarine types. Oregon's candidate, the South Slough of Coos Bay, is the first area selected as an estuarine sanctuary by the federal Office of Coastal Zone Management, largely because of early groundwork done by local people. The establishment of an estuarine sanctuary is complicated by interwoven ecological, social, economic and political issues. The potential benefits of the protection of an irreplaceable resource and the contribution to coastal zone management unquestionably justify the effort. Oregon anticipates completion of purchases and agreements and the establishment of the South Slough estuarine sanctuary by early spring 1975. (Wilson-Florida)
W80-04922

SAVING CALIFORNIA'S COAST: THE COASTAL ZONE INITIATIVE AND ITS AFTERMATH,
Resources for the Future, Inc., Washington, DC.
R. G. Healy.
Coastal Zone Management Journal, Vol 1, No 4, p 365-394, 1974.

Descriptors: *California, *Coasts, *Shore protection, *Land use, Buildings, Regulation, Permits, Construction, Coastal structures, Development, Recreation, State governments.

In 1972 California voters approved a proposal that would give control over nearly all construction along its entire coast to powerful state and regional commissions. By the end of 1975, these commissions must present an enforceable coastline plan to the legislature. Meanwhile, they have broad power to prevent or modify proposed building in an area extending from 3 miles offshore to 1,000 yards inland from the shoreline. The permit zone includes a wide variety of natural environments and possible area uses, including open water, large tracts of undeveloped land, beach towns and resorts, and some of the nation's most valuable urban property. In dealing with permit decisions, the commissions have had to face the real problems of the coast. The coastal regulators have acted on more than 5,000 permits, including controversial issues of beach access, density, agricultural preservation, power plant siting, and growth inducement. The state commission has interpreted its powers broadly, and counteracted an initial timidity on the part of the regional boards. (Wilson-Florida)
W80-04924

REGULATION OF WATER POLLUTION FROM AGRICULTURAL POINT SOURCES IN NEBRASKA: IMPACT OF THE NPDES PERMIT PROGRAM ON FEEDLOT OPERATIONS,
H. C. Harris, and M. Hendricksen.
Creighton Law Review, Vol 9, No 1, p 83-101, September 1975.

Descriptors: *Nebraska, *Agricultural runoff, *Pollution abatement, *Feedlots, Permits, Federal water pollution control act, Environmental effects, Livestock, Remedies, Water pollution control, Agriculture, Water pollution sources.

The National Pollutant Discharge Elimination System, NPDES, incorporated into the Nebraska plan, prohibits the discharge of pollutants from a point source into any Nebraskan waters without a permit. Animal confinement facilities, or feedlots, are point sources. Every Nebraska feedlot operator with a present or potential pollution discharge into Nebraskan waters must apply for an on-site inspection. The inspection determines whether the operator must obtain an NPDES permit and/or construct livestock waste controls. To ensure compliance with the required standards, a monitoring system may be established. Any feedlot operator in violation of effluent limitations, permit conditions, or administrative orders may be subject to administrative penalties, injunctions and civil or criminal suits by either state or federal authorities. The effectiveness of Nebraska's regulation of water pollution from livestock waste runoff and other sources is evaluated under its state administered NPDES permit program. (Schwerer-Florida)
W80-04925

AN EVALUATION OF LOUISIANA SUPERPORT STUDIES AND IMPLICATIONS FOR COASTAL ZONE MANAGEMENT,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
J. H. Stone.
Coastal Zone Management Journal, Vol 3, No 1, p 7-37, 1976. 2 Fig, 2 Tab, 30 Ref.

Descriptors: *Louisiana, *Coasts, *Shore protection, *Research and development, Environmental effects, Decision making, Management, Analytical programs, Economic impact, Techniques.

The economic and environmental consequences of a proposed Louisiana superport have been studied the last three years. These studies provided technical information and management alternatives. These studies are evaluated to derive implications, to make suggestions and to point out some analytical tools for coastal zone management. Management alternatives included: (1) state control to avoid multiple superport developments; (2) details for an Environmental Protection Plan; (3) comparisons of onshore and offshore sites; and (4) planning for ancillary development. Policy decisions which resulted include many of the research recommendations. Recommended environmental goals are listed. Six general features of the superport studies that are related and important to coastal zone management are discussed. Environmental research can influence policy decisions and limit available options provided some legal structure is created, quality control is implemented, and technological and environmental problems are recognized. Various analytical tools, such as energy cost-accounting, group critique and simulation models, have wide application for use in coastal zone management. A bibliography is included. (Daniels-Florida)
W80-04926

IDENTIFYING THE 'PUBLIC' FOR PARTICIPATION IN COASTAL ZONE MANAGEMENT,
California State Office of Planning and Research, Sacramento.
J. Ashbaugh, and J. Sorensen.
Coastal Zone Management Journal, Vol 2, No 4, p 383-409, 1976. 2 Tab, 29 Ref, 2 App.

Descriptors: *Coasts, *Shore protection, *Project planning, Planning, Administration, Regulation, Legislation, Surveys, Programs.

The federal Coastal Zone Management Act requires each coastal state apply for certification of its plan to design and implement a program of public participation. One of the more difficult aspects of public participation is the explicit identification of those groups and individuals who constitute the public with whom the coastal zone management agency will interest and collaborate in program development. Many factors raise difficulties in identifying and maintaining contact with the public. Five methods can be used to identify organized public groups: (1) self-identification; (2) snowballing; (3) directory research; (4) issue analysis; and (5) substitute advocacy. These methods, either alone or combined, can sufficiently identify those groups and individuals with whom the coastal management agency will interact, though other methods exist. A form survey is described that was designed to identify and maintain contract with groups that desired to participate in the development of California's coastal plan. (Daniels-Florida)
W80-04927

GROUNDWATER AUGMENTATION PLANS IN COLORADO,
J. P. McMahon.
The Denver Journal of International Law and Policy, Vol 6, Special Issue, p 552-566, 1976.

Descriptors: *Colorado, *Groundwater resources, *Water allocation(Policy), Prior appropriation, Water rights, Consumptive use, Legal aspects, Diversion, Diversion loss returns, Water supply, Groundwater resources.

The Colorado Supreme Court recently confronted two appeals from Colorado water courts. The dispute regarded questions relating to the attributes of Colorado water rights and the administration of these rights in accordance with the priority system. Both applicants sought court approval of augmentation plans under the Colorado statutes. The diversions under the proposed operations could be larger than those historically attributable to the water rights used for augmentation. Opponents argued that to grant permits would be a major break in the doctrine of prior appropriation; that these were not augmentation plans but really changes to water rights. In granting the permits, the Supreme Court interpretation of the phrase 'plan of augmentation' found the applicants to be within the scope and intent of the pertinent Colorado statutes. In the court's opinion, water was available for appropriation if no injury occured. Under these cases, an individual, low consumptive user, wanting to change his water use or bring new usages into the system may be required to rectify only the depletive effects of such water use. (Schwerer-Florida)
W80-04928

THE ROLE OF THE STATE IN WATER PLANNING, RESEARCH, AND ADMINISTRATION,
Colorado Dept. of Natural Resources, Denver.
H. D. Sherman.
The Denver Journal of International Law and Policy, Vol 6, Special Issue, p 449-453, 1976.

Descriptors: *Colorado, *Water management(Applied), *Water resources development, State governments, Administrative agencies, Waste disposal, Beneficial use, Legal aspects, Colorado River, Regulation, Legislation, Planning.

The future role of the Colorado State Government in water resource planning is evaluated. In view of changing conditions, state regulation and control will require adaptation. Several key areas of change are perceived. Initially, increased water consumption and salinity problems will increase the frequency of water rights transfer, change in point of diversion, and change in use. Additional areas of change analyzed include large-scale water resource developments, state government growth policy, and the managerial function of state agencies. Suggested changes in the pure appropriation system are also explored, with comparisons to Wyoming and Utah. Since Colorado water law now assumes that all growth and development give rise to 'beneficial use' of water, a legislative clarification is needed to develop effective guidelines for state water policies. Several other areas of needed change are examined and possible improvements are suggested. (Schwerer-Florida)
W80-04929

INTERSTATE RIVER COMPACTS: IMPACT ON COLORADO,
Upper Colorado River Commission, Salt Lake City, UT.
I. V. Goslin.
The Denver Journal of International Law and Policy, Vol 6, Special Issue, p 415-439, 1976. 1 Tab, 1 App.

Descriptors: *Colorado, *Colorado River, *Colorado River compact, *Interstate compacts, Conservation, Interstate rivers, Water resources, Water contracts, Consumptive use, Water conservation, Water allocation(Policy), Water quality.

Water compacts to which Colorado is a party influence the nature and direction of future state development, conservation, and utilization of water resources. Compacts are a mutually agreeable means of settling existing water disputes and preventing future controversies over the waters of interstate streams. To date, Colorado is a party to nine interstate water allocation compacts and to three interstate agreements that can be designated as subcompacts. Their terms have served as parameters for resource development processes. The Colorado River compact is regarded as the grandfather of water allocation compacts in the United States. The following is a listing of the remaining eight compacts to which Colorado is a party: La Plata River compact, South Platte River compact, Rio Grande compact, Republican River compact, upper Colorado River Basin compact, Arkansas River compact, Costilla Creek compact, and the Animas-La Plata Project compact. Compacts have been beneficial to Colorado in protecting the use of interstate waters against prior appropriation and use in other states. Other areas of significant impact include water quality, water supply and litigation. (Schwerer-Florida)
W80-04930

THE ROLE OF WATER IN THE HISTORY AND DEVELOPMENT OF COLORADO,
D. Lavender.
The Denver Journal of International Law and Policy, Vol 6, Special Issue, p 407-414, 1976.

Descriptors: *Colorado River, *Colorado River basin, *Colorado River compact, *Colorado, Agriculture, Mining, Prior appropriation, Mountains, Beneficial use, Interstate compacts, Interstate rivers.

Water's role in Colorado's development is controlled largely by geography. High elevation causes the capture of a disproportionate amount of rainfall, and the streams created are difficult to control. Agriculture was the first water use, but the law that developed grew out of the mining industry. With increasing colonization came conflicts over accelerated demands on water resources, especially the Colorado River. Intrastate problems were settled by the law of prior appropriation. This was not adequate for interstate problems, and compacts were necessary instead. Colorado got 52% of the Colorado River's upper basin, all of which originates on Colorado's western slope. Since there was little beneficial use there, the Eastern slope has been appropriating it. Now there is opportunity for profitable development on the western side, and a fear that the water resources will be insufficient. The outcome is unclear, but prior history indicates that a compromise might be a better solution than strict prior appropriation law. (Tabano-Florida)
W80-04931

GLOBAL WATER LAW SYSTEMS AND WATER CONTROL,
Colorado State Univ., Fort Collins.
G. E. Radosevich.
The Denver Journal of International Law and Policy, Vol 6, Special Issue, p 263-282, 1976. 1 Fig.

Descriptors: *Water allocation(Policy), *Water control, *Water management(Applied), *Consumptive use, Water consumption(Except consumptive use), Water rights, Water law, Water policy, Water resources, Water supply, Governmental interrelations.

Water laws are viewed as policy expressions that must be dynamic and the product of evolutionary processes. Several water systems of the entire world are summarized here. Systems with a customary religious base view water as part of man's cosmogony, allowing no private ownership. Latin American nations use either a traditional, riparian-influenced system, or a modern system of state comprehensive water management. Several European systems are discussed, such as the United Kingdom's governed entirely by statute. The federated system of the United States is also summarized, as are the common law - influenced Asiatic systems. Eight general conclusions are reached: (1) there is a clear tendency toward public ownership; (2) the basin is an imperative for improved management; (3) users should have input in decision-making; (4) unity is needed at all government levels; (5) water courts should be established; (6) 'acquired' rights must be redefined; (7) vested rights should not be a permanent constraint; and (8) specialists need an interdisciplinary foundation. (Tabano-Florida)
W80-04932

FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976: AN ACCOMMODATION OF STATE, FEDERAL AND INTERNATIONAL INTERESTS,
A. J. Tassi.
Case Western Reserve Journal of International Law, Vol 10, No 3, p 703-738, Summer 1978.

Descriptors: *Fish conservation, *Fish management, *Law of the seas, Fisheries, International law, Regimes, Federal government, Conservation, Legislation, Regulation, Jurisdiction.

The impact of the 1976 Fishery Conservation and Management Act (FCMA) upon traditional regulatory and conservation efforts of fishery resources is examined. Primary emphasis is given to fishery jurisdiction in United States (U.S.) coastal waters. The traditional approach to fishery jurisdiction is analyzed in the context of an Alaskan Supreme Court decision, State v. Bundrant. This case accurately illustrates the conventional interplay among state, federal, and international interest and the treatment accorded each before the FCMA. By enacting the FCMA Congress entered into the field of extraterritorial fishery jurisdiction. They provided a national regulatory authority aimed at accomodating state, federal and international interests. The pertinent FCMA provisions, and their impact upon state and federal management interests are examined. The FCMA's influence in the area of international fishery affairs is discussed, including the mandatory revision of certain U.S. obligations. The potential tensions which could result from this requirement to renegotiate treaties is examined. Overall, the FCMA is evaluated favorably. (Daniels-Florida)
W80-04933

WATER LEGISLATION PERSPECTIVES FOR ALABAMA,
Alabama Univ., University.
H. Cohen.
Alabama Law Review, Vol 26, No 1, p 177-213, Fall 1973.

Descriptors: *Alabama, *Water resources, *Water allocation(Policy), Regulation, Water utilization, Water policy, Water rights, Legislation, Water users, Control, Administration.

Alabama's response to the problems inherent in the allocation and use of water is examined. The court's are unable to plan and coordinate water allocation, as is illustrated by hypothetical situations. The problem areas discussed include riparian rights, groundwater use, and diffused surface water and the control of watercourses. Legislation of states other than Alabama enacted to alleviate the above problems is examined. The controls over individual users necessary to effectively implement comprehensive planning give rise to constitutional attacks on water use statutes. Two grounds for a constitutional challenge are improper delegation of legislative authority and takings. Potential challenges to Alabama's water rights legislation are examined. A legislative approach to water control is suggested to Alabama legislative which will help Alabama take a bold step in the direction of state water control. (Daniels-Florida)
W80-04934

MANAGING RECREATIONAL RIVERS,
National Association of Attorneys General, Raleigh, NC.
B. A. Rich.
Akron Law Review, Vol 8, No 1, p 43-56, Fall 1974.

Descriptors: *Illinois, *Recreation facilities, *Public access, Recreation, Navigable waters, Recreation demand, Public rights, Riparian rights, Regulation, State governments, Legal aspects.

Various regulatory approaches are discussed to provide and protect rivers with potential for use as public recreational facilities. These approaches are applied to the rivers of Illinois. Whenever public use of natural watercourses is considered, the concepts of riparian rights and navigability are fundamental issues. The evolution of these doctrines and their relation to public recreational water use are discussed. Methods by which Illinois may acquire riparian land to expand water-based recreation facilities, and the problems created by such methods of acquisition are discussed. By using examples of other state methods used to acquire water rights for the general public, alternative methods for acquiring recreational facilities for the public are presented. These alternative methods are progressive reform measures, enabling a state to provide needed recreational facilities. (Daniels-Florida)
W80-04935

THE LEGAL IMPLICATIONS OF GROUND WATER HEAT PUMP USE,
National Water Well Association, Worthington, OH.
J. Miller.
Ground Water Heat Pump Journal, Vol 1, No 1, p 29-35, Spring, 1980. 1 Tab.

Descriptors: *Heat pumps, *Legal aspects, *Permits, Ground water, Water quality, Water utilization, Well permits, Well regulations, Regulation, Government, Legislation, Water pollution control, Waste water disposal, Effluents, Injection wells, Local governments, Domestic water, Water law, State governments.

Federal, state, and local laws and regulations may impede ground water heat pump use. In many areas the drilling of a well requires a permit unless it has a certain capacity or is used for domestic purposes. In some areas the use of ground water for heating or cooling is not considered domestic use. Disposal of heat pump effluent is also subject to statutes and regulations such as the National Pollutant Discharge Elimination System (NPDES) and the Underground Injection Control Program (UIC). Federal regulations pertaining to ground water quality will not have a significant impact as the wells used for heat pumps are Class V wells under the UIC program. At the state level, well construction requirements vary. The expense of these requirements may make heat pump use impractical. Where water use restraints exist, usually in the form of permit requirements, they are not serious deterrants to heat pump use. Some local controls on well construction, ground water use and quality, and waste disposal may adversely affect heat pump utilization. Most local regulations, however, will not seriously impede widespread use of heat pumps. A summary table lists state regulations for domestic ground water heat pump use and effluent disposal. (Purdin-NWWA)
W80-04957

A 'COMMON HERITAGE' APPROACH TO FISHERIES THROUGH REGIONAL CONTROLS,
M. J. Brodd.
New York Journal of International Law and Politics, Vol 10, No 1, p 171-202, Spring 1977.

Descriptors: *Law of the Sea, *Marine fisheries, *Regional development, United Nations, Interna-

tional law, Treaties, International waters, Regimes, Resources development, Resource allocation.

The 1977 Informal Composite Negotiating Text (ICNT), produced by the United Nations, provides that seabed resources beyond the limits of national jurisdiction, will be controlled by an international authority for the benefit of all nations. The approach is exploitation pursuant to the common heritage of mankind. The ICNT also establishes an Exclusive Economic Zone for each coastal nation for fishery exploitation with a breadth of 200 miles. Landlocked states are permitted to share in the exploitation of fisheries within adjoining state's exclusive zones. If the ICNT is adopted, one problem will be to harmonize the concepts of exclusive national rights of a coastal state in its economic zone and the landlocked nations rights to share in that zone's resources. The possibility of required organizations as a means of implementing these competing rights is explored. Regional agreements and control are a viable compromise. An international regime of multistate regional arrangements is justified by and consistent with the common heritage principle. Under regional regimes, the benefits of both these competing approaches to resource utilization can be realized within the spirit of international cooperation. (Daniels-Florida)
W80-04960

PROSPECTS FOR DEEP SEABED MINING,
L. S. Ratiner.
The Journal of International Law and Economics, Vol 12, No 2, p 191-194, 1978.

Descriptors: *Beds under water, *International waters, *Mining, *Law of the Sea, United States, Legislation, Regimes, International law, United Nations, Treaties, Resource development.

United States (U.S.) legislation is needed to promote private development of ocean mining and to facilitate the establishment of an international mining enterprise. Ocean mining will help the U.S. become more self-sufficient in its supplies of various resources, such as cobalt, copper, mangenese and nickel. Reliance on countries advocating producer cartels creates the risk of supply interruptions. Emerging economic nationalism in developed countries further decreases opportunities for foreign investment in resource development. The key difficulty in the development of ocean mining is that investments made under present international law could be significantly impaired by a later treaty. This risk must be reduced, if not removed. The traditional approach has been to provide grandfather rights in new laws for previous investments. In the case of a treaty, this would require agreement by many countries. The U.S. should assure that industry is compensated for its investment losses. The establishment of an international mining enterprise would hasten if domestic legislation were enacted and mining began promptly. If other countries see the U.S. aggressively pursuing ocean mining they will be motivated to negotiate a treaty. (Daniels-Florida)
W80-04961

AN ANALYSIS OF THE OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1978,
Nossaman, Waters, Krueger, Marsh and Riordan, Los Angeles, CA.
R. B. Krueger, and L. H. Singer.
Natural Resources Journal, Vol 19, No 4, p 909-927, October 1979.

Descriptors: *Continental shelf, *Resources development, *Water pollution control, Continental slope, Legislation, Energy, Federal government, Oil spills, Coasts, Leases, Administrative agencies.

Beneath the 1.3 million square miles of continental shelf over which the United States has jurisdiction, there exists an enormous quantity of energy resources. The first federal act to authorize the leasing of the resources of the Outer Continental Shelf (OCS) was the 1953 Outer Continental Shelf Lands Act. This statute remained unchanged until the passage of the 1978 Outer Continental Shelf Lands Act Amendments (1978 Act). While the bulk of the 1978 Act consists of amendments to the 1953 Act, it also establishes an Offshore Oil Spill Pollution Fund and a Fisherman's Contingency Fund, and amends the 1972 Coastal Zone Management Act. The major policy objectives of the 1978 Act include: (1) making oil and other natural resources available; (2) protecting the environment; (3) maintaining free enterprise competition with respect to resources development; and (4) providing coastal states with an opportunity to participate in policy and planning decisions relating to the resources of the OCS. (Wilson-Florida)
W80-04962

THE COASTAL AREA MANAGEMENT ACT IN THE COURTS: A PRELIMINARY ANALYSIS,
North Carolina Univ. at Chapel Hill.
P. G. Glenn.
The North Carolina Law Review, Vol 53, No 2, p 303-343, December 1974.

Descriptors: *North Carolina, *Coasts, *Land use, *Shore protection, Environmental control, State governments, Regulation, Administrative agencies, Water resources, Legal aspects, Legislation.

The 1974 Coastal Area Management Act (Act) is a significant piece of legislation for North Carolina. The Act creates a mechanism for coordinated state and local regulation of land and water in the coastal area. This area has been denominated by the Coastal Resources Commission as an area of environmental concern. The formulation of general land use plans are required for each of the twenty coastal counties. The Act is virtually free of legislative direction on the substance of regulatory policy. The reason of the Act's lack of substantive content is that it is difficult to regulate aspects of potential dispute except in broad terms. Lawsuits dealing with the application of the Act to particular land probably will focus on the reasonableness of the regulation or order being contested. The Act mandates a permit system for certain development. Permit denials are likely to result in claims that the underlying regulation constitutes an unconstitutional taking of private property. Such attacks could invalidate the Act or substantially weaken it. (Wilson-Florida)
W80-04963

CONFLICT OF INTEREST RULES APPLICABLE TO WETLAND AGENCY MEMBERS,
C. L. Chambers.
Connecticut Bar Journal, Vol 49, No 1, p 178-188, March 1975.

Descriptors: *Connecticut, *Land use, *Wetlands, Judicial decisions, Administrative agencies, Legislation, Legal aspects, Zoning, Planning, Water policy, Water law, State governments.

The Connecticut Wetlands Act (Act) was amended in 1974 to limit the participation of members of Inland Wetlands agencies in decisions where there is conflict of interest. The amendment prohibits a member of any board or commission from participation in any hearing or decision upon any matter in which he is directly or indirectly interested either personally or financially. This amendment incorporates portions of the conflict of interest provisions in Connecticut statutes governing the disqualification of members of zoning authorities and planning and zoning boards. These statutes reflect the stringent prohibitions of Connecticut's case law in the conflict of interest area. The Act does not prohibit agency members from representing the viewpoint of other commissions where the viewpoint would contribute to balanced decision making. A leading case concludes that any decision as to whether a person's interest will be sufficiently disqualifying is necessarily a factual one which depends on the circumstances of the particular case. Implicitly, the Connecticut decisions appear to rely on a rebuttable presumption that the commissions and boards have acted with fair and proper motives. (Wilson-Florida)
W80-04964

ACID MINE DRAINAGE AND THE PENNSYLVANIA COURTS,
Duquesne Univ. of the Holy Ghost, Pittsburgh, PA. School of Law.
R. Broughton, T. A. Koza, and G. F. Selway.
Duquesne Law Review, Vol 11, No 4, p 495-555, Summer 1973.

Descriptors: *Pennsylvania, *Acid mine water, *Judicial decisions, *Coal mine wastes, Legislation, Coal mines, Legal aspects, Drainage, Constitutional law, Pollutants, Water pollution control, Streams.

In March 16 and April, 1973, Pennsylvania courts issued three decisions relating to coal mine drainage in Pennsylvania. These cases deal with major federal constitutional issues, and with some of the most critical technical and philosophical problems of any mine acid pollution control program. The discharge of acid mine drainage into already polluted waters was prohibited in Pennsylvania by the 1965 Clean Streams Law which was amended in 1970. In the Pittsburgh Coal and Harmar Coal cases, the Supreme Court decided that: (1) the Clean Streams Law was applicable to acid mine drainage from inactive as well as active mines; (2) the Clean Streams Law was Constitutional; and (3) there was substantial evidence to support a finding by the Sanitary Water Board. The Barnes and Tucker case involved a discharge from a mine after the mine was sealed. The Commonwealth Court held Barnes and Tucker not responsible for abatement and treatment of this acid mine drainage. (Wilson-Florida)
W80-04966

ENVIRONMENTAL CITIZEN SUITS: THREE YEARS' EXPERIENCE UNDER THE MICHIGAN ENVIRONMENTAL PROTECTION ACT,
Michigan Univ., Ann Arbor.
J. L. Sax, and J. F. DiMento.
Ecology Law Quarterly, Vol 4, No 1, p 1-62, Winter 1974.

Descriptors: *Michigan, *Adjudication procedure, *Water pollution control, Legal aspects, Water law, Land use, Judicial decisions, Pollution abatement, State governments, Legislation, Environmental control.

The Michigan Environmental Protection Act (Act) was the first statute to provide for citizen suits to protect the environment from degradation by either public or private entities. The federal Clean Air Act and Water Pollution Control Amendments, and several state statutes, have followed the Michigan lead. During the first three years since the Act's enactment, 74 cases have been initiated. The broad standing provision in the Act has produced a very diverse set of plaintiffs, local and state agencies, neighboring property owners, taxpayer and citizen groups, and established environmental organizations. One of the more important decisions was Irish v. Green. The plaintiff challenged a proposed housing development on four counts, one of which was that seepage from septic tanks was likely to cause water pollution. The court found for the plaintiff on the water pollution issue, but dismissed claims of wasteful land use and failure to provide an environmental impact statement. The Act has received relatively little substantive interpretation. One encouraging development is the frequency with which public agencies have invoked the Act. (Wilson-Florida)
W80-04967

PRIVATE ACTIONS FOR DAMAGES RESULTING FROM OFFSHORE OIL POLLUTION,
M. M. Gordon.
Columbia Journal of Environmental Law, Vol 2, No 1, p 140-192, Fall 1975.

Descriptors: *Oil spills, *Oil pollution, *Damages, International law, Federal government, State government, Common law, Water pollution, Jurisdiction, Compensation, Public rights.

Oil pollution of coastal and interior waters damages both private and public interests. Federal legislation deters both accidential and intentional discharge, but such legislation is deficient in protect-

ing private interests. Despite this gap in federal coverage, private damage suits are being brought. These suits are examined in the context of the relevant common law and recent developments at the state and international levels. United States jurisdiction extends to all admiralty and maritime cases. Admiralty jurisdiction is invoked when alleged conduct results in a maritime tort. Oil pollution of navigable waters can constitute such a tort. The traditional theories of liability discussed are negligence, private and public nuisance, trespass, unseaworthiness, and strict liability for abnormally dangerous activities. State legislation is classified under four headings. Maine's legislation is the most desirable for the private plaintiff. A board determines third party damages rather than a judicial proceeding in court. Recommendations are offered for legislation to remedy obstacles to recovery for offshore oil pollution. (Daniels-Florida)
W80-04968

LAYING THE FOUNDATION FOR SOPHISTICATED ENVIRONMENTAL STRATEGIES: A FLORIDA CASE STUDY,
Florida Univ., Gainesville.
J. W. Little.
Columbia Journal of Environmental Law, Vol 1, No 1, p 110-146, Fall 1974.

Descriptors: *Florida, *Permits, *Public rights, Legislation, Standards, Environmental effects, Legal aspects, Navigable waters, Preservation, Conservation, Constitutional law.

Two basic routes must be followed to increase the scope of existing environmental protections - public interest litigation and legislation. Public interest proponents have attained a high degree of sophistication in their efforts to expand public control over matters once thought controlled by private interests and government. Also described is how the law was molded through litigation before the sophisticated, strategy-laden environmental law suits of today. Today's public interest efforts are based on these earlier environmental campaigns. A Florida case history is given of the controversial dredging and filling of estuarine areas to demonstrate the development of environmental legal strategies. Local and state proceedings are discussed, involving the right of two small landowners to dredge and fill. The multitude of legal skirmishes clarifies state law and influences much protective legislation. Another factor was a federal ruling which allowed permit denial for dredge and fill based solely on environmental considerations. (Daniels-Florida)
W80-04969

FOREIGN ACCESS TO U.S. FISHERIES IN THE WAKE OF THE FISHERY CONSERVATION AND MANAGEMENT ACT,
G. S. Yarema.
Virginia Journal of International Law, Vol 18, No 3, p 513-567, Spring 1978.

Descriptors: *Fisheries, *Resource allocations, *Foreign countries, *Fish management, Foreign trade, Administrative decisions, Negotiations, Legislation, Conservation, Resources development, Management.

The impact of the 1976 Fishery Conservation and Management Act (FCMA) upon both the traditional and innovative types of foreign involvement in United States (U.S.) managed fisheries is analyzed. The FCMA scheme directly authorizes foreign fishing through international governmental negotiations. There are several contingencies on which such arrangements depend. The distinction that the FCMA draws between foreign fishing and U.S. fishing permits preferential access to the U.S. Zone for U.S. corporate fishing ventures controlled by foreign investors. Legislative proposals to restrict foreign investment in U.S. fishing corporations are discussed. Such measures would not contribute effectively to long-term management of the U.S. zones' resources, or serve the interests of important sectors of the domestic fishing industry. The application of FCMA to the purchase of the U.S. catch at sea by foreign-flag factory vessels under joint venture agreements is explored. The Department of Commerce has tried to regulate the allocation of harvested resources, but that effort exceeded the authority delegated by the FCMA. (Daniels-Florida)
W80-04970

THE LAW OF THE SEA AND REGIONAL FISHERIES POLICY,
South Pacific Commission, Noumea (New Calidonia).
R. E. Kearney.
Ocean Development and International Law Journal, Vol 5, No 2/3, p 249-286, 1978. 1 Fig, 6 Tab, 43 Ref.

Descriptors: *Law of the Sea, *Marine fisheries, *Fish management, *International waters, United Nations, Fisheries, Fish migration, Fish conservation, Regional development, Fish harvest, Resources development, Pacific Ocean.

The consequences of the inevitable acceptance of extended jurisdiction and its impact on fisheries policy in the South Pacific are considered within the framework of the principles outlined at the Third Session of the United Nations Law of the Sea Conference. The region's fisheries resources are dominated by highly migratory species, particularly tunas. The management of the fisheries on these species and the conservation of the species will require comprehensive regional cooperation. A regional fisheries agency is considering the required to protect the common interests of the region's developing countries which are inexperienced in fisheries management and in surveillance and enforcement capabilities. A wide range of possible functions of such a body is discussed, and a three-phase approach to the development of the agency is proposed. (Schwerer-Florida)
W80-04971

TRANSIT RIGHTS AND U.S. SECURITY INTERESTS IN INTERNATIONAL STRAITS: THE 'STRAITS DEBATE' REVISITED,
Pittsburgh Univ., PA.
C. E. Pirtle.
Ocean Development and International Law Journal, Vol 5, No 4, p 477-497, 1978.

Descriptors: *United States, *Straits, *Law of the Sea, *Military aspects, Oceans, Access routes, Transportation, Negotiations, International waters, Economic impact, United Nations, Navigation.

The issue of transit rights through international straits overlapped by an extension of territorial seas to 12 miles was the focal point of intense debate between the United States (U.S.) and strait states during the formative stages of the Third United Nations Law of the Sea Conference. Even though the Informal Composite Negotiating Text provisions on transit through straits reflect basic U.S. navigation and security interests. The issue of transit rights through straits is not a dead issue. Straits states may refuse to ratify a Law of the Sea treaty incorporating ICNT provisions on transit passage, or attempts to obtain a comprehensive LOS treaty may end in failure. In either case, the United States may be forced to accept a right of innocent passage through international straits. Transit security will be determined by political rather than legal considerations. U.S. security interests in the straits are not undermined by a right of innocent passage. (Schwerer-Florida)
W80-04972

AREA OF ORIGIN STATUTES - THE CALIFORNIA EXPERIENCE,
California State Dept. of Water Resources, Sacramento.
R. B. Robie, and R. R. Kletzing.
Idaho Law Review, Vol 15, No 3, p 419-441, Summer, 1979.

Descriptors: *California, *Water distribution(Applied), *Water supply, *Water transfer, State governments, Water works, Water policy, Water deliver, Water resources development, Wild river act, Water shed management, Water shortage.

As a result of unevenly distributed water supplies and water shortage problems in rapidly growing areas, several interregional water transfers have been implemented in California. Area of origin laws provide both an economically feasible source of water for transfer and protection to originating areas. Examined are the major water transfer acts effective in California, and the history of the nearly half-century old County of Origin and Area of Origin Acts. The application of these acts to the construction and operation of the California State Water Project is considered. The area of origin law affects the State Water Project in two ways. First, protected areas are given certain preferential rights to contract for water. Second, certain rights are given to construct projects or make diversions without being subject to the prior rights acquired under state application for the State Water Project. Recent federal and state statutes providing additional protection to areas of origin are also discussed. (Schwerer-Florida)
W80-04973

JUDICIAL REVIEW OF EPA ACTION UNDER THE CITIZEN SUIT PROVISION,
J. H. Chu.
Columbia Journal of Environmental Law, Vol 3, No 2, p 262-305, Spring 1977.

Descriptors: *Federal Water Pollution Control Act, *Administrative decisions, *Judicial decisions, *Water quality standards, Administrative agencies, Legislation, Reviews, Standards, Environmental effects, Legal aspects, Water pollution control.

Congress recognized the need for judicial review of administrative decisions affecting environmental concerns. Two statutory provisions in recent major federal pollution control legislation authorize judicial review of specified actions taken by the Administrator of the federal Environmental Protection Agency. One such provision allows for citizen suits against the Administrator where there is alleged failure to perform any nondiscretionary act or duty. The jurisdiction of each provision as interpreted by the courts is clarified. Expansion of the citizen suit jurisdiction is suggested. The present judicial test for establishing jurisdiction limits the citizen suit provision. Citizen suits have been limited by the courts to compelling the Administrator to act when he has breached a nondiscretionary act, and have been precluded from review of any abuse of discretion by the Administrator. A more rigorous standard of review is advocated. (Daniels-Florida)
W80-04974

SOME IMPLICATION OF OCEAN RESEARCH,
Washington Univ., Seattle.
W. S. Wooster.
Ocean Development and International Law Journal, Vol 4, No 1, p 39-50, 1977.

Descriptors: *Research and development, *Upwelling, *Law of the Sea, Political aspects, Oceans, Foreign countries, Research priorities, Economic justification, Research facilities, Scientific personnel.

Modern ocean research is more expensive than many laboratory sciences partly because of the costly research vessels required for field work. Funding for ocean research is justified on the basis of expected benefits. Such research also has political implications relating to the law of the sea and to the transfer of technology. Some of these implications can be illustrated in an analysis of upwelling research. Upwelling is an oceanic process of vertical flow and mixing that occurs on eastern sides of the Atlantic and Pacific Oceans and along the equator, among other locations. Potential benefits include predicting fishery yields, forecasting weather and climate, and locating and assessing nonliving resources. Because of the location of coastal upwelling, many developing countries are concerned with sharing in these benefits. This concern has affected negotiations over control of marine scientific research in the law of the sea negotiations, and is related to the need to develop scientific capability in such countries. (Wilson-Florida)

W80-04975

UNITED STATES POLICY WITH RESPECT TO HIGH SEAS FISHERIES AND DEEP SEABED MINERALS - A STUDY IN CONTRACTS,
L. W. Finlay.
Natural Resources Lawyer, Vol 9, No 4, p 629-643, 1976.

Descriptors: *Fisheries, *Beds under the sea, *Law of the Sea, *International law, United Nations, Conferences, Mining, Fishing, Oceans, International commissions, Treaties, Jurisdiction, *Beds under water.

Two important points are considered regarding the impact of the on-going deliberations in the Third United Nations Conference on the Law of the Sea on United States (U.S.) high seas fisheries and deep seabed minerals policies. First, proposals must be regarded as the views of individual states, rather than principles of existing law. Second, the convention will not create new international law for non-participating states. Exclusive coastal state fisheries jurisdiction to the 12 mile offshore is now generally accepted principle of international law. However, as the International Court of Justice decided in the Fisheries Jurisdiction Case, a coastal state may not take matters exclusively into its own hands in the determination of its preferential fishing rights. With respect to seabed resources, customary international law confirms the exclusive jurisdiction of coastal states over the seabed resources within their continental margins. (Wilson-Florida)
W80-04976

INNOVATIVE PROGRAMS AND PROPOSALS FOR THE RECONCILIATION OF PRIVATE AND PUBLIC INTERESTS IN THE CALIFORNIA COASTAL ZONE,
Nossaman, Waters, Krueger, Marsh and Riordan, Los Angeles, CA.
L. L. Marsh.
Natural Resources Lawyer, Vol 10, No 2, p 257-278, 1977.

Descriptors: *California, *Public rights, *Shore protection, *Land use, Land management, Regulation, State governments, Decision making, Judicial decisions, Equity, Urbanization, Legal aspects.

Urbanization problems are particularly acute in California's coastal zone. Reaction to these problems has spawned land use legislation at both the federal and state levels. The significant issue involved in land use management systems is the proper rule of private interests and the various governmental agencies representing public interest at the local, regional, state and federal levels. A few innovative proposals and suggestions for reconciling public and private interests in the coastal zone are focused on. The historic development of the private property concept and of government land use regulation is traced. The coordination of government planning and permit processing is discussed. The coordination process involves interagency cooperation in planning and permit processing. Procedures and arrangements provided for the reconciliation of public interests are also important to private interests. Historically, private interests were relied on to make land use decisions. Present problems demand modification of that system. Land use management systems must reconcile public and private interests and recognize the proper role of each. (Daniels-Florida)
W80-04977

ADDITION TO THE ANNUAL REVIEW OF SIGNIFICANT LEGISLATIVE, ADMINISTRATIVE AND JUDICIAL ACTIVITIES DURING 1976: WATER QUALITY COMMITTEE.
American Bar Association, Washington, DC. Natural Resources Section. Water Quality Committee.
Natural Resources Lawyer, Vol 10, No 2, p 297-322, 1977.

Descriptors: *Federal Water Pollution Control Act, *Judicial decisions, *Administrative decisions, Regulation, Permits, Legislation, Administrative agencies, Legal aspects, Water pollution control, Water law.

In 1976 no significant or substantive changes were made in the Federal Water Pollution Control Act (FWPCA); Safe Drinking Water Act; or the Marine Protection, Research and Sanctuaries Act. The federal Environmental Protection Agency (EPA), which administers these acts, promulgated a broad body of important regulations in 1976. A large number of significant judicial decisions interpreting the FWPCA's requirements were rendered in 1976. These administrative and judicial decisions are discussed. The EPA administrative decisions concerned (1) Secondary Treatment of publicly-owned treatment works; (2) Effluent limitation guidelines and new source performance standards for industrial point sources; (3) Toxic pollutant effluent standards; (4) Pretreatment; (5) Oil and Hazardous Substances; (6) Marine Sanitation devices; (7) Thermal discharges; (8) Dredged or fill material; and (9) the NPDES permit program. The judicial decisions between January 31, 1976 and February 23, 1977, shows trends and inconsistencies between cases. Principle emphasis is on cases involving the central regulatory and enforcement provisions of Title III or the permit provisions of Title IV of the FWPCA. Cases involving oil spill and citizen suit provisions are reviewed. Cases concerning the sewage treatment facility grant program of Title II are not reviewed. (Daniels-Florida)
W80-04978

COAL SLURRY TRANSPORTATION SYSTEMS AND RELATED WATER RIGHTS AND WATER QUALITY PROBLEMS,
International Paper Co., Mobile, AL.
W. Kiechel, Jr.
Natural Resources Lawyer, Vol 11, No 3, p 411-417, 1979.

Descriptors: *Legal aspects, *Watersupply, *Coal, *Transportation, Legislation, State governments, Environmental effects, Navigable waters, Watershed management, Judicial decisions, Political constraints.

Coal slurry pipelines offer a number of advantages today. Coal and water are the two basic ingredients for a coal slurry pipeline. Problems of legal availability of water is the critical issue with respect to coal slurry pipelines. While the areas where coal originates seek expanded coal usage, they are hostile to exporting water to transport the coal. Legal and political problems arise from the diversion of water from one watershed to coal slurry pipelines. The reserved rights doctrine of water law and its amenability to coal slurry pipeline use are considered. Two concepts limit the doctrine's use for coal slurry pipeline purposes. Other sources of water supply are navigable waters, federal reclamation projects or other multi-purpose federal projects. Another key issue in the feasibility of a coal slurry pipeline is the crossing of railroad right-of-ways. There is proposed federal legislation that would grant the right of eminent domain to pipelines. Coal slurry pipelines should be considered. (Daniels-Florida)
W80-04979

THE COASTAL ZONE MANAGEMENT ACT AND ITS POTENTIAL IMPACTS ON COASTAL DEPENDENT ENERGY DEVELOPMENT,
McCutchen, Black, Verleger and Shea, Los Angeles, CA.
H. J. Privett.
Natural Resources Lawyer, Vol 11, No 3, p 455-505, 1979.

Descriptors: *Coasts, *Shore protection, *Land use, Management, Regulations, State government, Federal government, Programs, Legal aspects, Resource development, Legislation.

The effect of the 1972 Coastal Zone Management Act (Act) on the development and content of state coastal management programs is analyzed. Prior to their approval, it is important that state programs comply with the Act. Interim final regulations, published on March 1, 1978, revised and superseded several prior regulations regarding development and approval of state coastal management programs. The more significant aspects of the new regulations are discussed in an issue by issue analysis of the Act's procedural and substantive requirements. Two novel concepts of general application are introduced by the regulations. First, a 'refinement' procedure exempts procedural changes to approved programs from the requirements of the Act which apply to program amendments. Second, states are authorized to include unenforceable enhancement policies in their management programs. The second concept runs directly counter to the requirement that programs be enforceable. The procedural requirements relate to program development, design, adoption and implementation. The substantive requirements include specific provisions that state programs must contain. The Twelve major substantive requirements are set forth and discussed. (Daniels-Florida)
W80-04980

MARICULTURE, THE LAW OF THE CONTINENTAL SHELF AND OFFSHORE OIL RECOVERY: A TECHNOLOGY AFFECTED BY A BODY OF LAW EFFECTED BY A TECHNOLOGY,
M. E. Shirley.
Natural Resources Lawyer, Vol 11, No 4, p 725-753, 1979.

Descriptors: *Marine fisheries, *Continental shelf, *Aquaculture, *Law of the Sea, Technology, Oceans, Oil platforms, Marine animals, Fishing, Fish farming, National seashores, Oceanography.

Recent developments in offshore oil and gas technology and deep ocean mining have led to the necessity for reviewing and perhaps redrafting various aspects of the law of the sea. In order to bring a higher degree of rationality to government policy-making with regard to these developments, there is a need for closer interaction between science, technology and law. Topics explored in this article are: (1) the impact of the technology of offshore oil recovery upon the law of the continental shelf; (2) the development of the law of the sea to date and short-term forecasts; and (3) the impact of the law thus developed upon mariculture, as yet a relatively unrelated technology. The legal boundaries established in response to the growth of offshore oil recovery will determine the legal regime in which the infant industry of mariculture will develop its technology. Further analyzed are legal developments in coastal laws and their application to the formulation of new ocean-use rules and regulations governing manmade mariculture stations at sea. (Schwerer-Florida)
W80-04981

DEVELOPMENT OF THE RIO GRANDE COMPACT OF 1938,
R. A. Hill.
Natural Resources Journal, Vol 14, No 2, p 163-200, April 1974.

Descriptors: *Rio Grande River, *Water supply development, *Water contracts, Water supply, Water allocation, Water policy, Irrigation water, Allotments, Water users, *Interstate compacts, Colorado, New Mexico, Texas.

The 1938 Rio Grande Compact (1938 Compact) was entered into by Colorado, New Mexico and Texas. It was designed to provide maximum beneficial use of water in the Rio Grande basin above Fort Quitman, Texas, without impairing any previous supplies beneficially used. The history of the 1938 Compact is reviewed. Long before 1938, it was obvious that quantities of water obtainable for the Rio Grande were not sufficient to meet the area's irrigation demands. In 1926, the federal government undertook a study to develop a program to rehabilitate the Middle Rio Grande Valley. The reaction to this program was adverse by water users in Colorado, Texas, and New Mexico who feared any expansion of upstream use would impair their water supply. This led to the Rio Grande Compact of 1929. The 1938 Compact was an expansion of the 1929 Compact. The provisions of the 1938 Compact are analyzed, including a clarification of its meaning and intent. (Daniels-Florida)

W80-04982

OBSTACLES TO GEOTHERMAL DEVELOPMENT,
For primary bibliographic entry see Field 5C.
W80-04983

USE OF THE WATERS OF THE COLORADO RIVER IN MEXICO: PERTINENT TECHNICAL COMMENTARIES,
I. L. Cabrera.
Natural Resources Journal, Vol 15, No 1, p 27-34, January 1975.

Descriptors: *Colorado River basin, *Water quality, *Salinity, *Mexico, *United States, Colorado River, Colorado River Compact, Treaties, Water resources, Water users, Agriculture, River basins, Riparian waters.

The Colorado River Basin spreads over both Mexico and the United States. A valley was formed by the river, of which the two countries each own half. It is prime agricultural land and each country uses the river to irrigate it. The United States gained control of the river and a treaty was signed in order to clearly fix Mexico's rights. Although this treaty guarantees a certain quantity of water to Mexico, it says nothing of quality. A salinity problem developed and highly saline groundwater was being pumped to Mexico as part of its allotment. The United States argued no violation of the treaty, but the treaty refers to the water used by each country as being equal. The United States argued that the situation was a result of a reasonable use of the waters within its territory, but the assumptions it made were not totally sound. After much negotiation, the United States promised to take measures to guarantee that the waters turned over to Mexico would be of permanently acceptable quality. (Tabano-Florida)
W80-04985

THE COLORADO RIVER SALINITY AGREEMENT OF 1973 AND THE MEXICALI VALLEY,
Arizona State Univ., Tempe.
D. B. Furnish, and J. R. Ladman.
Natural Resources Journal, Vol 15, No 1, p 83-107, January 1975.

Descriptors: *Colorado River, *Salinity, *Mexico, *United States, International law, Water users, Irrigation water, Water quality, Water delivery, Governmental interrelations, Treaties, International waters.

The most troublesome aspects of the 1973 Colorado River Salinity Agreement (Agreement) and their ramifications for United States (U.S.) - Mexican relations and international law are examined. The river is of major economic importance to Mexico as it provides irrigation for agriculture in nearby valleys. An historical overview is presented of the river's use and the dealings between the two countries concerning its use. The genesis of the Agreement is examined. All the Agreement accomplishes is that the U.S. has a duty to deliver water of usable quality across the border. Despite confidence in the Agreement, there is no absolute definition of the allowable salinity level. There are also potential delivery problems to the San Luis Valley. There also may not be sufficient water to allow for all consumptive uses. The U.S. has offered nonreimbursable assistance for improvement and rehabilitation. Implementing legislation for the Agreement is considered. The Agreement is insufficient to avoid future controversy and a new treaty may need to be negotiated. (Tabano-Florida)
W80-04986

FISHERY CONSERVATION AND THE LAW OF THE SEA.
In: Proceedings of the Seventy-Second Annual Meeting, April 27-29, 1978, Washington, D.C. the American Society of International Law, p 321-343, 1978. ASIL, Washington, D.C.

Descriptors: *Law of the Sea, *Fish management, *Fish conservation, *Marine fisheries, Fish, International commissions, United Nations, Oceans, Fishing, Resources, Marine animals, Fisheries.

The United Nations Conference on the Law of the Sea has had limited success, despite two separate redraftings of its negotiating text. The Law of the Sea negotiations began several years ago with early emphasis on developing an acceptable international regime for fisheries conservation and management. The present negotiating text being used by the Conference gives each coastal state the right to manage and the obligation to conserve all the fish within a 200 mile economic zone. Establishment of United States control over its 200 mile fisheries area and similar action by many other coastal states has produced several problems. One difficulty has been with management of fishermen, both domestic and foreign. In 1976, Congress passed the Fishery Conservation and Management Act, giving the United States jurisdiction over all fish except tuna within its 200 mile economic zone. The Law of the Sea negotiations have provided a good framework for establishing regimes for fisheries conservation and management throughout the world. In addition lesser known resources, such as krill, may become the world's major fishery product. Studies for the exploitation and management of these resources should be undertaken in the future. (Wilson-Florida)
W80-04987

A THEORETICAL ANALYSIS OF MINUTE 242,
New Mexico Univ., Albuquerque.
A. V. Kneese.
Natural Resources Journal, Vol 15, No 1, p 135-140, January 1975.

Descriptors: *Colorado River, *Salinity, *International waters, *Economic justification, International law, Economics, Governmental interrelations, Benefit sharing, Compensation, Water law, United States, Mexico.

The 1973 Colorado River Salinity Agreement is examined from an economic point of view. Four types of situations are presented which seem to characterize most cases involving international watercourses: (1) pure 'public goods' situations; (2) situations where upstream development provides benefits for both upstream and downstream countries; (3) the 'common property' situation; and (4) the 'zero sum situation'. The situation between the United States and Mexico is viewed as a 'zero sum' situation. This means that the water use by an upstream country diminishes the benefit to the downstream country, but the downstream user cannot retaliate in any direct way. In this situation, there can be no basis for agreement unless the victum country compensates the damaging country for costs incurred to reduce the damage. In this Agreement, however, the United States has agreed to pay the entire cost of mitigating the damage. Extraneous considerations must have been dominant in the decision, most notably the projection of a proper national image. This Agreement will not be the final word on the matter. (Tabano-Florida)
W80-04988

NEW MEXICO'S NATIONAL FORESTS AND THE IMPLIED RESERVATION DOCTRINE,
R. A. Marquez.
Natural Resources Journal, Vol 16, No 4, p 975-1002, October 1976.

Descriptors: *New Mexico, *Reservation doctrine, *Federal-state water rights conflicts, Judicial decisions, Forest management, Federal government, State government, Forests, Water rights, Administrative agencies, Prior appropriation.

There is a great federal-state conflict over the waters of the western United States. The source of conflict is the implied reservation doctrine which vests water rights in the federal government. The principal federal agency affecting New Mexico water rights is the Forest Service. The New Mexico State Engineer has steadily attacked the implied reservation rights claimed for New Mexico's National Forests. Both the State Engineer and the Forest Service claim a better right to use of the water, an increasingly scarce and valuable resource. A reserved federal water right has certain characteristics incompatible with state appropriation water law: (1) created without diversion or beneficial use; (2) unlost by nonuse; (3) priority-dated from the time of land withdrawal; and (4) measured by the amount of water necessary to satisfy the purposes for which the land has been withdrawn. Perhaps the doctrine's foremost problem is that of compensation. Most of the recommended federal legislation supports some type of compensation for impaired vested uses. (Wilson-Florida)
W80-04989

THE PATRIMONIAL SEA TO THE RESCUE OF THE GULF OF CALIFORNIA,
Universidad Nacional Autonoma de Mexico, Mexico City.
A. Szekely.
Natural Resources Journal, Vol 17, No 1, p 113-122, January 1977.

Descriptors: *Mexico, *Boundary disputes, *Gulfs, *International law, History, Law of the Sea, United States, Bays, Internal waters, International law, Legal aspects, Fishing, *Gulf of California.

During the last twenty years, several sectors of the Mexican community have alleged that the Gulf of California should be regarded as part of the Mexican territory. They have demanded that the government proceed, in the national interest, to close the Gulf. To substantiate these allegations and demands, they have invoked a legal, historic title supported by international law. In 1975, Mexico announced its definite plans to claim a two-hundred mile patrimonial sea or exclusive economic zone. This measure would have the logical and immediate effect of closing the Gulf of California to foreign fishermen. Under the provisions of the 1958 Geneva Convention, the Gulf of California is considered a geographical bay. Because the imaginary line drawn across the mouth of the Gulf measures approximately 110 miles, it cannot be regarded as internal waters of Mexico. Many Mexican jurists have argued that the Gulf was a Mexican 'historic bay'. Mexico's claim to the Gulf of California has actually been affected more by internal differences than by external influences. (Wilson-Florida)
W80-04990

THE PRESSURE FOR SHORELINE DEVELOPMENT: SPATIAL CONCEPTS IN REVIEW,
Ottawa Univ. (Ontario).
P. Harrison.
Coastal Zone Management Journal, Vol 3, No 3, p 319-322, 1977.

Descriptors: *Washington, *Public access, *Coasts, *Shore protection, Public benefits, Sea shores, Ecosystems, Resources development, Environmental effects, Ecology, Developed waters.

The complex structure of the coastal ecological system creates certain delicate subzones that have little if any regenerative capacity. Shallow, easily stratefied waters are less capable of coping with the impact of human development than more open turbulent waters. The calibration of carrying capacities of coastal systems is a difficult and as yet unclear process. Certain generalizations can be made. First, high-density, nodul development is generally unsuited to coastal areas of low carrying capacity and to areas of high capacity extremely limited in extent. Second, low-density or spread development would seem to be a significant underutilization of high carrying capacity areas. Spread development tends to preempt public access, by closing off shoreline use to all except a small group of owners. Public access is related to environmental carrying capacity. Excessive access to ecologically delicate areas is perhaps the best way to promote environmental degradation. (Wilson-Florida)
W80-04991

A GENERAL INTERNATIONAL LAW DOCTRINE FOR SEABED REGIMES,
Syracuse Univ., NY.

L. F. E. Goldie.
International Lawyer (A.B.A.) Vol 7, No 4, p 796-824, October 1973.

Descriptors: *Oceans, *Mining, *Beds under water, *Law of the Sea, International law, Underwater, Regime, Exploitation, Governments, United Nations, Common law, Claims.

Various proposals for seabed regimes, methods to manage international seabeds are compared with general international law governing deep seabed mining activities. Decisional law is examined regarding concepts of possessory rights under international law. Cases from Anglo-American common law illustrate the misleading effects caused by stressing the need for a specific, immediate and active control to establish possession. The common law development of miner's rights is discussed, focusing on the practices in the American west. Similar practices arising in international law are appraised. The concept of acquired rights is discussed. The United Nations' Moratorium resolution and common heritage clause are examined in relation to general international law. The relations of seabed - exploitating enterprises operating under laws of different states are examined, as are the relations between two or more American enterprises in international seas. (Daniels-Florida)
W80-04992

INTERNATIONAL CONTROL OF DUMPING AT SEA,
G. J. Timagenis.
Anglo-American Law Review, Vol 2, No 2, p 157-187, April-June 1973.

Descriptors: *Law of the Sea, *Waste disposal, *International commissions, International law, International waters, Internal water, Wastes, Water pollution control, Coasts, Legal aspects, Oceans.

The conventional rules, judicial precedents, and general principles of international law of the sea are clearly inadequate to meet the problems raised by waste disposal at sea. Traditional international law has dealt with waste disposal in two contexts: (1) territorial sea and internal waters; and (2) high seas and contiguous zones. States have sovereignty in the territorial sea areas, subject to the rules of international law. A state has the right to dispose of waste material in the high seas, 'with reasonable regard to the interests of other states.' The 1969 International Legal Conference on Marine Pollution Damage in Brussels adopted a resolution recommending that work be intensified on all aspects of pollution other than oil. The 1972 United Nations Conference on the Human Environment in Stockholh adopted recommendations for future action for the preservation and improvement of the environment. The first regional convention dealing with dumping was signed in Oslo in 1972 by twelve European countries. The United States initiated efforts in 1971 for an instrument to control ocean dumping. (Wilson-Florida)
W80-04993

A COMPREHENSIVE OIL POLLUTION LIABILITY AND COMPENSATION ACT: HOW SUPER IS THE 'SUPER FUND',
S. J. Tresidder.
Detroit College of Law Review, Vol 1978, No 2, p 277-306, Summer 1978.

Descriptors: *Oil spills, *Compensation, *Oil pollution, *Damages, Economic impact, Water pollution effects, Economic justification, Legislation, International law, Water law, Water pollution control, Oil industry.

In recent years, oil spills have received increasing attention. Massive spills have caused extensive damage and cost millions of dollars. Proposed federal legislation provides for a comprehensive oil pollution liability and compensation program. Rules governing traditional means of compensation for oil spill damage are found in federal maritime statutory and common law. The limitations of traditional recovery methods has led to the proposed statutory modifications. One of the primary purposes of the federal statutory changes has been to alleviate the problems of funding for rapid removal of spilled oil. Oil spill compensation systems have been affected by federal and state legislation, international law, and voluntary agreements. The so-called 'Super Fund' legislation, currently pending in Congress, would create a complete system of oil spill compensation for cleanup costs, damages to third parties, and environmental injury. The 'Super Fund' drawback is its strong potential for losing money. The importance of protecting United States water resources outweighs any potential cost problems. (Wilson-Florida)
W80-04994

LEGAL SYSTEM REQUIREMENTS TO CONTROL AND FACILITATE WATER AUGMENTATION IN THE WESTERN UNITED STATES,
K. S. Danielson, G. W. Sherk, Jr., and L. O. Grant.
The Denver Journal of International Law and Policy, Vol 6, Special Issue, p 511-525, 1976.

Descriptors: *Colorado, *Artificial precipitation, *Water yield improvement, *Weather modification, Legal aspects, State jurisdiction, Appropriation, Atmosphere, Water resources, Water resources development, Watershed management, Water rights.

Problems of water augmentation are twofold. First is the complexity of the weather modification aspect of water augmentation. These fundamental problems are environmental, social, and legal. Second, legal uncertainties concerning water augmentation will necessarily involve the issue of water rights. The different approaches to water ownership in the western United States is examined, with emphasis on a recent Supreme Court of Colorado decision to the question of the ownership of water produced by water augmentation activities. Water augmentation activities include weather modification and watershed management techniques. These techniques will require legal system responses to protect both water rights holders and the general populace. Areas examined regarding legal system requirements include: state claims to water, water for weather modification, water from augmentation, and artificial water. Possible legal system responses are suggested and the legal and political obstacles are analyzed. (Schwerer-Florida)
W80-04995

JUDICIAL REVIEW UNDER FEDERAL POLLUTION LAWS,
Chicago Univ., IL.
D. P. Currie.
Iowa Law Review, Vol 62, No 5, p 1221-1280, June 1977.

Descriptors: *Federal water pollution control act, *Water quality standards, *Judicial decisions, Administrative agencies, Clean Air Act, Legislation, Legal aspects, Permits, Federal jurisdiction, Reviews, Water pollution control.

In an effort to remedy uncertainties in their predecessor statutes, both the Clean Air Act (CAA) and the federal Water Pollution Control Act (FWPCA) were amended in the early 1970's to include explicit provisions for judicial review. Experience has shown that uncertainties persist; the time has come for legislative re-examination. Both statutes are administered by the federal Environmental Protection Agency. Both are extraordinarily complicated. The heart of the FWPCA is a permit system whose administration may be delegated to the states under specified conditions. Section 509(b) of the FWPCA provides for judicial review of certain federal standards and limitations regulating pollution discharges and review of federal action on permits. The FWPCA is silent about judicial review regarding regulation of sewage discharge from vessels and oil discharge, of the decision to allow additional time to comply with emission control standards. The FWPCA and CAA accord with the modern trend allowing direct appellate review of informal rulemaking. Additional review problems occur regarding jurisdiction and standing, due to certain inconsistent, incomplete or ambiguous provisions. (Wilson-Florida)
W80-04996

STATE AND LOCAL WETLANDS REGULATION IN THE COURTS: CONSTITUTIONAL PROBLEMS ON THE WANE,
S. M. McCraw.
Harvard Environmental Law Review, Vol 1, p 496-514, 1976.

Descriptors: *Wetlands, *Constitutional law, *Land use, Judicial decisions, Legal aspects, Legislation, Regulation, State governments, Ecology, Water law, Economic justification.

Two recent decisions represent emerging judicial acceptance of state wetlands regulation. Plaintiffs in both cases attacked the constitutionality of state wetlands statutes on the grounds that they allowed a taking of private property without just compensation. The two decisions are valuable precedents for upholding wetlands regulation based on reasoning that recognizes the ecological crisis caused by unchecked wetlands development. These two cases, in conjunction with other recent wetlands decisions, indicate potential strategies for legislators and litigants concerned with wetlands protection. A review of recent wetlands cases demonstrates the desirability of drafting wetlands regulations expecting future court challenges. The most important feature of a statute or ordinance in this regard is an introductory statement recognizing the economic value of unaltered wetlands, wetlands ecological functions, and their interrelation with other environmental elements. Added to this introductory statement should be a declaration of state policy to place wetlands regulation under state police power. (Wilson-Florida)
W80-04997

COASTAL ZONE MANAGEMENT AND STATE-LOCAL RELATIONS UNDER THE LOUISIANA CONSTITUTION OF 1974,
Washington, Univ., Seattle.
M. J. Hershman, and M. M. Mistric.
Loyola Law Review, Vol 22, No 1, p 273-300, Winter 1975-76.

Descriptors: *Louisiana, *Coastal marshes, *Shore protection, *Constitutional law, State governments, Estuaries, Coasts, Legal aspects, Legislation, Administrative agencies, Federal project policy, Local governments.

Conservation of Louisiana's extensive coastal marshes and estuaries has been receiving increased attention by the Louisiana legislature in the past six years. In 1974, the Governor designated the State Planning Office to receive the first of three annual planning grants, under the 1972 federal Coastal Zone Management Act, to develop a state coastal management program. With the adoption of the 1974 Louisiana Constitution, which provides for increased autonomy of local government from the state legislature, certain local government leaders challenged the state's power to adopt a coastal management program which is binding on home rule charter governments. There are three articles in the 1974 Constitution which relate to the state's power to implement coastal zone management (CZM) legislation. Article III, Section 1 vests in the state legislature all legislative power not specifically prohibited by the Constitution. Article XIX, Section 18, provides that the police power shall never be abridged. Article IX, Section 1, provides that state natural resources shall be protected by the state legislation. These provisions arguably answer local government officials seeking local insulation from state CZM programs. (Wilson-Florida)
W80-04998

ENVIRONMENTAL LAW,
Jones, Walker, Waechter, Poitevent, Carrere and Denegre, New Orleans, LA.
S. O. Buckley, III.
Loyola Law Review, Vol 24, No 3, p 341-359, Summer 1978.

Descriptors: *Judicial decisions, *Federal Water Pollution Control Act, *Administrative agencies,

Legislation, Clean Air Act, Federal government, Federal jurisdiction, Legal aspects, Water pollution control, Environmental control, Water quality.

The decisions rendered by the Fifth Circuit during the 1977-78 term, reflect the growth and evolution of federal environmental legislation. In recent years, the vast majority of environmental issues have been decided under the 1969 National Environmental Policy Act (NEPA). The NEPA preceded the plethora of specific federal legislation that now covers air, water, solid waste disposal, and other activities. The three NEPA decisions rendered by the Fifth Circuit involved an initial federal agency determination that an environmental impact statement was not required. The Fifth Circuit also analyzed four cases involving the Federal Water Pollution Control Act and amendments thereto. These cases covered the entire spectrum of federal Environmental Protection Agency (EPA) authority from the agencies permit authority to its enforcement responsiblity once permits have been granted. In general, these cases demonstrated a tendency of the Fifth Circuit to defer to the EPA's interpretation of its authority and responsibility under the FWPCA. (Wilson-Florida)
W80-04999

ADMINISTRATIVE WATER RIGHTS INSPECTIONS IN CALIFORNIA,
W. D. Cunningham, and S. J. Imperati.
University of California, Davis, Law Review, Vol 12, No 1, p 105-124, March 1979.

Descriptors: *Water rights, *Inspection, *California, Legal aspects, Water resources, Water demand, Administrative agencies, Regulation, Appropriation, Legislation, Water law.

The ability to enter on private property to conduct water rights inspections is essential to the proper administration of California's water rights scheme. Without it, the State Water Resources Control Board would be unable to perform its statutory duties. The Board's Division of Water Rights receives much voluntary cooperation from most water rights holders. A problem may arise when water rights holders deny Board inspectors access to their private property. Such refusal raises several questions regarding the legality of any subsequent Board entry: (1) whether the Board has the power to enter and make nonconsensual water rights inspections; (2) whether the Board can make these inspections without an administrative inspection warrant; and (3) whether the Board has the authority under the California Code of Civil Procedure to obtain an inspection warrant if one is required. Although California courts have yet to address any of these questions, they cannot avoid dealing with them in the near future. (Wilson-Florida)
W80-05000

CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER.
Law and Policy in International Business, Vol 6, No 2, p 575-586, Spring 1974.

Descriptors: *International law, *Waste disposal, *Law of the Sea, *International waters, Wastes, Water pollution, Water pollution control, Treaties, Political aspects, Pollution abatement, Oceans.

Ocean dumping is not presently a serious problem, but will be in the near future. Because of this threat, the United States submitted a draft convention to the Intergovernmental Working Group on Marine Pollution. The convention is designed to improve the marine environment's quality by prohibiting the dumping of hazardous substances and by regulating the dumping of potentially dangerous materials. Other sources of marine pollution are left to later conventions. The problems and advantages of dealing with marine pollution on a piecemeal basis are discussed. The convention's effectiveness in preventing marine pollution is explored. The effectiveness is hard to predict, dependent on a variety of factors. The most serious shortcoming of the convention is the lack of an effective international enforcement mechanism. The economic effects of the convention are briefly examined. Although the terms of the convention are relatively weak, it is a first step toward the international control of marine pollution. (Daniels-Florida)
W80-05001

LAW OF THE SEA: ITS IMPACT ON THE INTERNATIONAL ENERGY CRISIS,
Ad Hoc Committee on Mineral Resources Beneath the Seas, Washington, DC.
L. W. Finlay, and M. S. McKnight.
Law and Policy in International Business, Vol 6, No 3, p 639-676, Summer 1974.

Descriptors: *Law of the Sea, *International law, *Energy, *Oil industry, Oil, United Nations, Conferences, Navigation, Environmental effects, Beds under water, International Commissions.

The Third United Nations Conference on the Law of the Sea convened in Caracas on June 20, 1974. The delegates were fully cognizant of the enormous impact of current energy shortages arising out of the Arab oil embargo. The most important topics discussed at the Conference affecting the energy crisis were: (1) the breadth of the territorial sea and the related question of the right of unimpeded passage through straits and archipelagic waters used for international navigation; (2) coastal state jurisdiction over seabed resources beyond the territorial sea; (3) deepwater ports; (4) preservation of the marine environment and liability for damages resulting from its use; (5) the regime for the international seabed area; and (6) activities pending the entry into force of a possible treaty. An equitable resolution of the procedural issues facing the Conference will be a critical determinant of its success, as will be the objectivity of the individual conferences in resolving the substantive issues. (Wilson-Florida)
W80-05002

FISHERIES JURISDICTION-UNITED STATES FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976, PUBLIC LAW 94-265, 94TH CONGRESS, H.R. 200,
J. Dorsey.
Harvard International Law Journal, Vol 18, No 1, p 177-185, Winter 1977.

Descriptors: *Fish management, *Fish conservation, *Marine fisheries, *Law of the Sea, United States, International law, United Nations, Fisheries, Legislation, Conferences, Anadromous fish, Jurisdiction.

On the authority of the 1976 Fishery Conservation and Management Act (Act), the United States (U.S.) will extend its fishery jurisdiction to 200 miles from the baseline from which the territorial sea is measured. The extension of the exclusive fishery jurisdiction to 200 miles is part of a comprehensive plan to establish effective conservation and management of U.S. marine resources. The plan is designed to first conserve and subsequently increase the fish yield and marine life in the exclusive fishery zone. The negotiating team from the executive branch which represented the U.S. at the Third Conference on the Law of the Sea led the fight in Congress against the unilateral extension over fisheries jurisdiction. Their principle concern was the effect the Act would have on U.S. negotiating leverage at the Conference. The Act does seem to be in accord with the developments at the Conference, best reflected by the Revised Single Negotiating Text. President Ford expressed his concern as to whether the U.S. has the right under international law to control anadromous species outside its own contiguous zone. (Wilson-Florida)
W80-05003

UNITED STATES OCEANS POLICY: PERSPECTIVE 1974,
Louisiana State Univ. Law Center, Baton Rouge.
H. G. Knight.
Notre Dame Lawyer, Vol 49, No 2, p 241-275, December 1973.

Descriptors: *Law of the Sea, *Oceans, *United States, *Resource allocation, United Nations, International law, Beds under water, Foreign countries, Fisheries, International commissions, Research and Development, Environmental control.

The United States (U.S.) has developed elements of a national oceans policy which it seeks to implement through agreements to be reached at the Third United Nations Conference on the Law of the Sea. There are five basic subject matter areas which this nation is presently emphasizing through its policy proposals: (1) the regime which will govern exploration for and exploitation of the nonliving resources of the seabed and subsoil. United States policy regarding coastal state jurisdiction over non-living seabed resources supports the economic resource zone concept. On the question of resources beyond national jurisdiction, U.S. policy favors an international regime; (2) the management of living marine resources. The U.S. acknowledges the state right to extend its fisheries jurisdiction; (3) Territorial Sea-U.S. policy has reflected a desire for a free flow of commerce; (4) Scientific Research - U.S. policy favors freedom of research in the oceans; and (5) Protection of Marine Environment - the U.S. has pressed for international agreements to handle various pollution problems. (Wilson-Florida)
W80-05004

FEDERAL CONTROL OF WETLANDS: THE EFFECTIVENESS OF CORPS' REGULATIONS UNDER SECTION 404 OF THE FWPCA,
J. M. Frasca.
Notre Dame Lawyer, Vol 51, No 3, p 505-521, February 1976.

Descriptors: *Wetlands, *Dredging, *Federal Water Pollution Control Act, Water pollution control, Administrative agencies, Judicial decisions, Jurisdiction, State governments, Legislation, Agriculture, Regulation.

Section 404 of the Federal Water Pollution Control Act Amendments (FWPCA) gives the United States (U.S.) Army Corps of Engineers (Corps) primary authority to regulate dredge and fill operations in 'navigable waters' of the U.S. Section 502(7) of the FWPCA defines the term 'navigable waters' as waters of the U.S., including the territorial seas. As late as April 1975, however, the Corps' regulations restricted its authority to only those waters subject to inundation by tidal waters and susceptible to interstate commerce. In 1975, the federal District Court for the District of Columbia decided the Corps' regulations were in derogation of its statutory duties. The Corps published new regulations which dramatically expanded that agency's regulatory powers. The most substantial criticism of the Corps' section 404 jurisdiction is based on its anticipated adverse impact on agriculture. Moreover, section 404 of the FWPCA was not initially enacted for the specific purpose of wetlands control. The Federal Coastal Zone Management Act has several advantages over FWPCA in this regard. Another serious deficiency of section 404 in wetlands control is the limited state participation. (Wilson-Florida)
W80-05005

DAM POLICY IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
E. R. Kaynor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182835, Price codes: A06 in paper copy, A01 in microfiche. Publication No 110, 1979. 95 p, 1 Fig, 2 Tab, 48 Ref, 2 Append. OWRT-A-113-MASS(1), 14-34-001-8023.

Descriptors: *Dams, *Dam policy, *Massachusetts, *Hydroelectric power, *Riparian rights, *Prior appropriation, Dam safety, Policy, Legal aspects, Governments, Decision making, Jurisdiction.

Massachusetts law contains detailed procedures for compensating those adversely affected by dams. However, court decisions have tended to absolve dam owners from culpability for damages. Massa-

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chusetts preaches riparian doctrine but practices prior appropriation doctrine. Massachusetts law also requires dam safety inspections, but inspections seldom occur because there are no funds. Recently, Massachusetts policy has strongly encouraged hydroelectric energy production with very little success in spite of sizeable state and federal incentives. Survey research reveals that part of the problem is that neither governmental officials nor the public at large are very interested in dams. There is little knowledge of how to proceed to make beneficial use of dams. There is also confusion over which governmental level has jurisdiction. The Commerce Clause together with liberal definitions of navigability tend to favor federal jurisdiction, but federal officials try to encourage state decision-making except where dams are built or licensed by federal agencies. This report recommends creation of a Dam Policy Deliberation Committee to further investigate dam functions and malfunctions in Massachusetts, and to recommend policy changes. It also recommends the creation of a state agency empowered to purchase unused, underused, or misused dams for development according to plans for maximum beneficial development. (Godfrey-Mass)
W80-05014

EPA CONSOLIDATION OF PERMITS PROPOSAL-REGULATORY WORKHORSE OR BUREAUCRATIC NIGHTMARE,
Water Pollution Control Federation, Washington, DC.
T. Kish.
Journal Water Pollution Control Federation, Vol 52, No 2, p 229-234, February 1980. 1 Fig.

Descriptors: *Permits, *Regulation, *Waste disposal, Benefits, State governments, Water pollution control, Legislation, Environmental Protection Agency, Administrative agencies.

This paper discussed the benefits and criticisms of proposed regulations aimed at consolidating and unifying procedures and requirements for EPA-administered permit programs to reduce ubiquitous delays. The five programs covered by the proposed regulations are: The Hazardous Waste Management Program; the Underground Injection Control Program; the National Pollutant Discharge Elimination System; the Dredge or Fill Program; and the Prevention of Significant Deterioration Program. Advantages include: environmental benefit, regulatory burden reductions, institutional and resource benefits, and public participation benefits. The proposed single permit form would include a general information section followed by separate sections for each EPA program except the Dredge or Fill Program. The major criticisms, extrapolated from over 5000 pages of written comments, are divided into general, program definitions and basic program requirements, state program requirements, procedures to be followed for making permit decisions, and the consolidated permit form. EPA contends that consolidated permits will provide for a more uniform, comprehensive, and consistent approach to EPA-administered permitting. Hopefully, it will also provide the states with a more uniform and accessible procedure for requesting and assuming permitting responsibility. (Purdin-NWWA)
W80-05037

SHIFTING EMPHASIS TO GROUND WATER,
Water Pollution Control Federation, Washington, DC.
For primary bibliographic entry see Field 5G.
W80-05059

BLACK-LISTING THE POLLUTERS,
Environmental Protection Agency, Philadelphia, PA. Region III.
R. W. Martin, Jr.
Federal Bar Journal, Vol 36, No 1-2, p 17-29, Winter-Spring 1977.

Descriptors: *Administrative agencies, *Pollution abatement, *Government finance, *Federal Water Pollution Control Act, Administrative decisions, Facilities, Environmental control, Government supports, Administration, Regulation, Federal government.

Pursuant to Section 306 of the Clean Air Act and Section 508 of the Federal Water Pollution Control Act, the Federal Environmental Protection Agency (EPA) can indicate to violators that federal funding may be withheld from their facilities unless there is compliance with the agency's regulations and guidelines. There are six bases upon which a facility may be listed for noncompliance, all indicating some type of court action having been taken against it. A facility might also be listed as ineligible under conditions which do not include a conviction. There is some dispute over this due to unclear legislative history, but the EPA sees its actions as justified. The Office of Federal Activities administers the program. A breakdown of responsibilities within the EPA and the procedure for listing are also set out. The program could be of real value if the EPA moved to ensure that all products come from facilities in compliance. 'National goals clauses' could be put in contracts between the government and facilities to implement this. The procedure has been used twice as of November 1976 against unconvicted violators, and this could be an effective leverage for speedy compliance. (Tabano-Florida)
W80-05067

STATE CONTROL OF OIL POLLUTION: LEGISLATING IN THE TWILIGHT ZONE,
M. Lipeles.
Harvard Environmental Law Review, Vol 1, p 431-457, 1976.

Descriptors: *Oil pollution, *Oil spills, *Federal government, *State governments, Legislation, Constitutional law, Constraints, Compensation, Legal aspects, Cost allocation, Remedies.

Existing federal statutes and common law remedies do not satisfactorily promote the three basic objectives of oil spill liability schemes. As a result, several coastal states have enacted or are considering proposals for oil spill liability and compensation laws. Parallel state and federal developments highlight the oil spill debates most controversial issue of whether the federal government should preempt state authority. This issue raises several questions which should be addressed to resolve the preemption controversy: (1) what constraints does the Constitution impose on state authority over oil spills; (2) what guidelines regarding state action has Congress enacted; (3) what states have done or seek to do regarding spill liability and compensation; and (4) what would be a constitutionally permissable and environmentally sound policy governing state and federal authority. The constitutional, statutory and judicial background to these questions are described. The focus is on current developments at the federal and state levels. It is concluded that Congress should not preempt state oil spill schemes. (Daniels-Florida)
W80-05068

CALIFORNIA'S TIDELANDS TRUST FOR MODIFIABLE PUBLIC PURPOSES,
T. H. Ziemann.
Loyola University of Los Angeles Law Review, Vol 6, No 3, p 485-525, September 1973.

Descriptors: *California, *Public rights, *Seashores, *Shore protection, Preservation, Land management, Environmental effects, Coasts, Ownership of beds, Public lands, Navigation, Fishing, *Tidelands.

The tidelands, that portion of the shore covered and uncovered by the daily ebb and flow of the tides, are an important, if not the key, area of coastal zone land use. California's tidelands are encompassed by the tidelands trust doctrine. The state, as trustee of a public trust, protects public uses in the foreshore. The public trust concept in its traditional molding was inadequate to protect the public interest. In 1971 the California Supreme Court recognized the public's right to preserve the foreshore. The history of the tidelands trust doctrine is examined to discover whether the doctrine is flexible enough to meet the current requirements of the public interest in tidelands. The state has limitations on the choice of tideland allocation, either absolute or conditional. State ownership is necessary when the general welfare requires public use of the foreshore. There is a recognized need for a redefinition of the requirements of general welfare. The uses within California's tidelands can be modified, and implementation of environmentally-based public uses would best protect the public interest. (Daniels-Florida)
W80-05069

PUBLIC PARTICIPATION IN LOCAL LAND-USE PLANNING: CONCEPTS, MECHANISMS, STATE GUIDELINES AND THE COASTAL AREA MANAGEMENT ACT,
D. W. Owens.
The North Carolina Law Review, Vol 53, No 5, p 975-1004, June 1975.

Descriptors: *North Carolina, *Land use, *Planning, *Public rights, Programs, Decision-making, State governments, Adoption of practices, Local governments, Legislation, Standards, Coasts, *Coastal Area Management Act.

The nature, extent and methodology of citizen participation in governmental planning and decision-making are important issues. Public participation should be given careful consideration in land use planning. North Carolina's 1974 Coastal Area Management Act (CAMA) contains provisions relating to public participation. However, the legislature made only perfunctury obeisance to the concept of public participation. The CAMA provisions and administrative proposals of the Coastal Resources Commission relating to public participation are discussed. The basic theories, definitions and issues involved in the concept of public participation are examined. There are at least three basic theories of citizen participation. Related to the choice of a theoretical basis for public participation is its meaning. Four basic definitional groupings are considered: citizen involvement, citizen influence, citizen power and citizen-government exchange. The mechanics and timing of public participation are discussed. Tools for public participation include: one-way output, one-way input, and interaction mechanisms. The requirements for public participation mandated by the CAMA are quite limited. Several recommendations to increase effective public participation are made. (Daniels-Florida)
W80-05070

THE EXTENT OF STATE OWNERSHIP OF SUBMERGED LANDS IN CALIFORNIA,
W. Arnone.
Hastings Law Journal, Vol 31, No 1, p 329-345, September 1979.

Descriptors: *California, *Boundaries(Property), *Ownership of beds, Judicial decisions, Boundary disputes, Legal aspects, Submerged lands act, Riparian rights, Public rights, Legislation, Navigable waters.

During 1970, the California Attorney General in conjunction with the California State Lands Commission initiated action to overturn 100 years of case and statutory law governing title to submerged lands in California. Statutory construction was generally that the state's ownership of these lands extended only to the low-water mark. The Attorney General asserted that state ownership of the lands beneath California non-tidal navigable waters extended to the high-water mark. This change in position has created uncertainty and confusion among the landholders potentially affected. The result has been a number of civil actions filed by landowners seeking judicial clarification of the extent of their landholdings. Until this issue is resolved conclusively, the property rights of all littoral and riparian landowners in California will remain in doubt. Several cases are now being heard at the appellate level. Both historically and legally the foundation for the state's claim is lacking. Therefore, judicial removal of this artificially created could upon title is imperative. (Wilson-Florida)
W80-05071

POLLUTION: INTERNATIONAL CONVENTIONS, FEDERAL AND STATE LEGISLATION,
J. J. Higgins.
Tulane Law Review, Vol 53, No 4, p 1328-1363, June 1979.

Descriptors: *Oil pollution, *Federal-state water rights conflicts, *International commissions, Oceans, International law, Oil spills, United Nations, Federal Water Pollution Control Act, State governments, Legislation, Ships.

The genesis of modern laws dealing with pollution of the oceans and littoral territories began in 1967 with the Torrey Canyon disaster. On the international level, oil pollution damage is covered by the Civil Liability Convention of the International Legal Conference, an agency of the United Nations. The Convention applies to ships carrying more than 2,000 tons of oil in bulk as cargo. The Convention covers oil pollution damage to the territory of a Contracting State. The Civil Liability Convention is supplemented by the Fund Convention. In the United States a party who suffers oil pollution damage may bring an action under common law and general principles of maritime law. The primary federal statute is the 1972 Federal Water Pollution Control Act (Act). The Act includes prohibitions against harmful discharges, requirements of evidence of financial responsibility, and provisions for penalties. Liability for oil pollution under state law depends on whether states are free to impose liability for such pollution. Questions have arisen whether state ocean pollution liability legislation unconstitutionally intrudes into an area of exclusive federal maritime jurisdiction or imposes a burden on interstate or foreign commerce. (Wilson-Florida)
W80-05072

FEDERAL WATER POLLUTION CONTROL ACT - THE FEDERAL GOVERNMENT'S EXCLUSIVE REMEDY FOR RECOUPMENT OF OIL SPILL CLEANUP COSTS,
R. T. Lemon, II.
Tulane Law Review, Vol 53, No 4, p 1421-1438, June 1979.

Descriptors: *Federal Water Pollution Control Act, *Oil spills, *Remedies, Oil pollution, Cleaning, Legislation, Judicial decisions, Environmental effects, Water pollution sources, Federal government.

The Federal Water Pollution Control Act (Act) was created to provide a national policy for the prevention, control and abatement of water pollution. One of the most serious threats to the waters of the United States is damage from oil spills. In addition to environmental damage, another effect of oil spills is the cleanup cost. The Act has provided a comprehensive plan designed to expedite oil pollution cleanup, and to establish a workable scheme for limiting liability for oil spill cleanup costs. Although other statutory and nonstatutory remedies exist concurrently with the Act, the federal government's exclusive remedy for reimbursement of cleanup costs is set forth in and limited by the Act. Although the Act does not state that it is the exclusive remedy, an examination of the Act's legislative history, of the statute's provisions and legislative character, and of the relevant case law indicate that the Act is the federal government's exclusive basis for recovery. (Wilson-Florida)
W80-05073

THE INTERNATIONAL REGIME FOR THE DEEP SEABED: PAST CONFLICTS AND PROPOSALS FOR PROGRESS,
Vanderbilt Univ., Nashville, TN. School of Law.
J. I. Charney.
Harvard International Law Journal, Vol 17, No 1, p 1-50, Winter 1976.

Descriptors: *Beds under water, *International commissions, *Law of the Sea, *Treaties, United Nations, International law, Conferences, International waters, Political aspects, Resources, Jurisdiction.

For the first time, virtually all nations of the world are seeking to establish an international organization to manage deep seabed resources. Nearly 150 nations participated in the second session of the Third United Nations Conference on the Law of the Sea. The principle product of that session was the Informal Single Negotiating Text (ISNT), which will form the basis for negotiations at the third session of the Law of the Sea Conference. Probably the most controversial part of the ISNT is that produced by the committee assigned to establish a regime for the management of seabed resources beyond the limits of national jurisdiction. Several compromise regimes have been suggested: (1) a phased regime; (2) a Tribunal with authority over the Seabed Authority; (3) open access for exploitation; and (4) modification of voting. All nations must give serious thought to the inadequacies present in the current First Committee texts and the available compromise solutions. (Wilson-Florida)
W80-05074

LAND USE CONTROLS IN COASTAL AREAS,
Kentucky Univ., Lexington
R. C. Ausness.
California Western Law Review, Vol 9, No 3, p 391-428, Spring 1973.

Descriptors: *Coastal marshes, *Coastal plains, *Land use, *Shore protection, Coasts, Environmental control, Legislation, Management, Water policy, Water pollution effects, Project planning.

Prolonged exploitation of coastal resources has caused extensive ecological harm. The coastal environment is acutely sensitive to human activities, like dredging, mining, and pollutant discharges. Estuarine areas have been particularly susceptible to harm from land development. Beach erosion is another adverse effect. A solution must include a wide range of regulatory devices, an administrative structure capable of effectively utilizing these enforcement tools, and a coherent public policy concerning the allocation of coastal zone resources. Any method of environmental control must take into account property rights in coastal areas. Congress enacted the Coastal Zone Management Act in 1972. This legislation seeks to encourage the development of comprehensive state management programs and the formulation of a national coastal zone policy. Governmental measures to protect the coastal environment are subject to a number of institutional and practical constraints, including commercial interests, inadequate state administrative resources, and due process requirement. Any effective implementation of a coastal zone management program must take into account these conflicting interests. (Wilson-Florida)
W80-05075

WILL THERE BE LAW AT SEA.
In: American Society of International Law: Proceedings of the Seventieth Annual Meeting, April 22-24, 1976, Washington, D.C., p 175-82, 1976. American Society of International Law, Washington, D.C.

Descriptors: *Law of the Sea, *International commissions, *International law, Negotiations, United Nations, Economics, Oceans, Foreign countries, Legal aspects, Jurisdiction.

The Law of the Sea negotiations raise a myriad of questions which deal with the deep seabed, 200-mile economic jurisdiction, the territorial sea and straits, scientific research, marine pollution, and dispute settlement. One question that will have to be resolved is which part of the deep seabed area will be open to exploitation. Furthermore, land-based producers fear that deep seabed mining would economically hurt them. The Informal Single Negotiating Text on the regime for straits used for international navigation was an attempt to find a compromise between those states that favored free transit and those that supported an innocent passage regime. In the exclusive economic zone, the central problem was how to harmonize other states' interests with those of the coastal state. The Single Negotiating Text imposed a general obligation on states to protect the marine environment. However, no real efforts have been made to deal with landbased pollution. A serious question remains as to the jurisdictional character of the 200-mile economic zone. The basic issue is whether an exclusive economic zone will take on the characteristics of a territorial sea. (Wilson-Florida)
W80-05076

INTERNATIONAL ENVIRONMENTAL PROTECTION: POLICY, LEGAL, AND TRADE ASPECTS.
In: American Society of International Law: Proceedings of the Seventy-First Annual Meeting, April 21-23, 1977, San Francisco, California, p 48-67, 1977. The American Society of International Law, Washington, D.C.

Descriptors: *International commissions, *Water pollution control, *Water pollution sources, *International law, Negotiations, Oceans, Water pollution, Environmental effects, Water law, Legal aspects, Water pollution effects.

The United Nations Conference on Human Environment in Stockholm in 1972 focused the attention of the international community on the issue of international environmental law. A principle achievement at Stockholm was the Declaration of Principles which set out principles of state responsibility for environmental damage. Since Stockholm, the attention has been mostly devoted to the ocean commons, including the effect of any new ocean regime on environmental aspects of ocean management. Other areas of concern include regulation of vessel source pollution, protection of living resources and transfrontier pollution problems. Transfrontier pollution includes disturbances that originate in one country, are transmitted through a shared natural resource, and effect another country or areas not under a specific national jurisdiction. A number of international bodies believe transfrontier pollution problems, to the extent possible, should be handled domestically. Countries should ensure foreign plaintiffs access to the same protection from environmental damage as is accorded their own inhabitants. National environmental measures with trade implications can take a number of forms either through regulations, taxes, or subsidies. (Wilson-Florida)
W80-05077

FLOOD CONTROL AND ARIZONA,
M. R. Rooney.
Law and the Social Order, Vol 1973, No 4, p 919-937, 1973.

Descriptors: *Arizona, *Flood control, *Flood plain zoning, *Flood protection, Legislation, Flood damage, Land use, Engineering projects, Project planning, Flood plains, Local governments, Zoning.

Despite its reputation as a desert state, Arizona has experienced severe, if infrequent flooding. In 1973, the Arizona legislature passed two bills designed to alleviate future flood damage. Flood control activities can be divided into two general areas: (1) corrective measures, or manmade engineering projects, designed to retain and control flood waters; and (2) preventive measures which regulate land use in areas susceptible to flooding. In passing the flood control assistance law, a corrective measure, the Arizona legislature for the first time made state funds available for a portion of the local share of a federally assisted flood control project. This law appropriates up to one-half of a community's share of project costs. On the other hand, the new preventive law attempts to regulate the development of the state's flood plains. Flood plain regulations are established to reduce the need for corrective projects. The strengths and weaknesses of both new flood control laws as applied in Arizona are analyzed. Possible modifications are recommended. (Schwerer-Florida)
W80-05078

FEDERAL JURISDICTION AND FEDERAL COMMON LAW - ENVIRONMENTAL LAW - PUBLIC NUISANCE SUITS CONCERNING IN-

TERSTATE WATER POLLUTION-ILLINOIS V. CITY OF MILWAUKEE, 406, U.S. 91 (1972),
R. A. Sherman.
Denver Law Journal, Vol 49, No 4, p 609-618, 1973.

Descriptors: *Judicial decisions, *Federal jurisdiction, *Water pollution control, *Illinois, Jurisdiction, Water pollution, State governments, Legal aspects, Sewage, Interstate, Waste disposal, *Wisconsin.

In the early 1970's the State of Illinois filed a motion for leave to file a bill of complaint under the original jurisdiction of the Supreme Court against four cities in Wisconsin and the Sewerage Commission of Milwaukee. Illinois requested that the Court abate the public nuisance being caused by the defendent's daily discharge of over 200,000,000 gallons of raw or inadequately treated sewage into Lake Michigan. The Court denied the motion and sent the case back to the appropriate federal district court for resolution of the controvery. The Court further reasoned that since the issue of a state-created public nuisance affecting another state is a federal question and that, in the absence of a specific substantive statutory remedy, the federal question should be resolved by applying the federal common law of nuisance. The significance of the decision lies in the Court's jurisdictional mandate and in its acknowledgement of the validity of federal common law in the adjudication of an interstate water pollution issue. (Wilson-Florida)
W80-05079

THE APPLICABILITY OF THE FEDERAL POLLUTION ACTS TO INDIAN RESERVATIONS: A CASE FOR TRIBAL SELF-GOVERNMENT,
L. E. Petros.
University of Colorado Law Review, Vol 48, No 1, p 63-93, Fall 1976.

Descriptors: *Indian reservations, *Clean Air Act, *Federal Water Pollution Control Act, Jurisdiction, Political aspects, Pollution abatement, Regulation, State jurisdiction, Federal jurisdiction, Water law.

The rapid development of Indian reservations raises the issue of how these lands are to be protected from pollution. Examined are the jurisdictional aspects of the Federal Water Pollution Control Act (FWPCA) and the Clean Air Act as applied to Indian reservation lands. Both acts are unclear as to whether Congress delegated power to the states to control pollution on reservation lands within their jurisdiction, or whether control was retained in the federal Environmental Protection Agency, the Interior Department of the Indian Tribes themselves. Of the two Acts, only the definitional section of the 1972 FWPCA even mentions Indians. Placing jurisdiction over Indian reservations in the states, absent an express congressional grant, violates basic principles of Indian law. Further analyzed is the question of whether self-regulation by the tribes exists within these two Acts. (Schwerer-Florida)
W80-05080

THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA: THE 1975 GENEVA SESSION,
J. R. Stevenson, and B. H. Oxman.
American Journal of International Law, Vol 69, No 4, p 763-797, October 1975.

Descriptors: *United Nations, *International law, *Law of the Sea, International waters, Treaties, Regulation, Governments, Boundary disputes, Political aspects, Legal aspects.

The principle procedural result of the Third United Nations Conference on the Law of the Sea (Conference) was the preparation of informal single texts covering all substantive subjects before the Conference. These texts are intended as a basis for negotiations of a comprehensive treaty. The texts are examined to explain the accomplishments of and the problems facing this Conference. The content of each text is compared with previous proposals and provisions. The texts of the following substantive subjects are examined: (1) the Territorial Sea and Contiguous Zone; (2) Straits Used for International Navigation; (3) The Economic Zone; (4) the Definition of Continental Shelf; (5) the High Seas; (6) Access to the Sea by Landlocked States; and (7) Archipelages. The conference also sought to compile standards on protection the marine environment. The overall effort of the conference is evaluated, successful completion of the conference was not met. (Daniels-Florida)
W80-05081

REGIONAL ARRANGEMENTS IN THE OCEANS,
Rhode Island Univ., Kingston.
L. M. Alexander.
American Journal of International Law, Vol 71, No 1, p 84-109, January 1977.

Descriptors: *Regional analysis, *Law of the Sea, *International waters, *Geographical regions, Regions, Institutions, Oceans, International law, Management, Treaties, Governmental interrelations.

Ocean management has changed since the first Law of the Sea Conference. Multistate regional interests and arrangements are emerging. Three types of marina regions are identified: (1) physical regions, basically ocean basins and semi-enclosed seas; (2) management regions, functional in nature and respond to management problem-solving; and (3) operational regions, sites of one or more regional arrangements. It is better to approach regional action from the perspective of environmental problems requiring action, than from the perspective of participating states, as concerns of each state may differ. Five necessary components of marine regional arrangements are discussed in detail: (1) the area of activity; (2) the institutional level; (3) the use category; (4) the objectives; and (5) the integrative forces. The scope of existing institutions is also presented to emphasize variations in nature and functions. Future developments hinge to a degree on the formulation of a treaty by the Conference. Regional arrangements will probably interact closely with certain geographic areas of the ocean, and international power relationships will no doubt be affected. (Tabano-Florida)
W80-05083

POLITICAL COBWEBS BENEATH THE SEA,
Committee on Interior and Insular Affairs (U. S. Senate).
D. P. Stang.
International Lawyer (A.B.A.), Vol 7, No 1, p 1-15, January, 1973.

Descriptors: *United Nations, *Law of the Sea, *Treaties, *Resources development, Conferences, Jurisdiction, Governments, International law, International waters, Water resources, *Beds under water, *United Nations Seabed Committee.

The accomplishments of the United Nations Seabed Committee are examined during a two year period ending the summer of 1972. The Seabed Commission was the preparatory body for a 1973 Law of the Sea Conference. Two documents were agreed upon at the summer 1972 session, the only tangible results of two years work. The first document is a list of 107 issues and sub-issues which the 1973 Law of the Sea Conference should discuss. The second document contains draft texts on seabed principles. It is contended the Seabed Committee did not reach agreement on the major issues. There is a summary of the major unresolved issues reflected in these documents. The inherently political nature of the Seabed Committee may be a reason for its inability to reach agreement on major issues. The potential benefits of a moratorium on states' activities in the seabed area beyond their national jurisdiction is examined. (Daniels-Florida)
W80-05085

MARINE RESOURCES COMMITTEE (ANNUAL REVIEW OF ACTIVITIES - 1975).
American Bar Association, Washington, DC. Natural Resources Section.
Natural Resources Lawyer, Vol 9, No 2, p 238-252, 1976.

Descriptors: *Marine fisheries, *Resources development, *Water pollution control, Beds under water, Administrative agencies, Water law, Coast guard regulations, Federal government, Judicial decisions, Legislation, Administrative decisions, *Outer Continental Shelf Lands Act.

As to United States (U.S.) offshore seabed resources, bills are pending in Congress that would extensively amend the Outer Continental Shelf Lands Act. In March, 1975, the United States Supreme Court decided the U.S. has sovereign rights over the seabed and subsoil underlying the Atlantic Ocean three miles from the coast. Coast Guard regulations for licensing, designing, constructing and operating deepwater ports were published in November, 1975. In 1975, the first preliminary approval of a state coastal zone management program occurred, when Washington's program was approved. Public Law 94-70 was enacted in 1975 to give effect to the International Convention for the Conservation of Atlantic Tunas. A proposed Convention on Civil Liability for Oil Pollution Damage from Offshore Operations was in the late stages of negotiation at the close of the year. The first criminal action under Section 311 of the Federal Water Pollution Control Act was initiated in Philadelphia against the captain of a Liberian tanker. (Wilson-Florida)
W80-05086

POSSIBLE SOLUTIONS TO THE 200-MILE TERRITORIAL LIMIT,
R. O. Freeman.
International Lawyer (A.B.A.), Vol 7, No 2, p 387-395, April 1973.

Descriptors: *Law of the Sea, *Resource allocation, *Boundary disputes, *Resources development, Resources, International law, International waters, Competition, Beds under water, Oceans, Conferences, United Nations.

Bilateral or multilateral agreements concerning the allocation of ocean resources are suggested as substitutes for unilateral declarations which attempt to control the exploitation of those resources. Controversy exists over the unilateral control of ocean resources beyond a nation's territorial limits. There is an analysis of the 200-mile limit, that zone extending up to 200 miles from a nation's coast, which some nations claim sovereignty over. The interests of the coastal antions are examined. Rather than having coastal nations decide the extent to which they may assert control over the contiguous sea, four alternative methods for deciding the extent of this control are given. International conventions regarding the exploitation of resources on a worldwide basis is considered the preferrable approach. A Cuban-Mexican draft proposal for an international convention, submitted at the Rome Conference of 1955, is briefly examined. The benefits of a convention and problems facing a convention's success are discussed. (Daniels-Florida)
W80-05087

INCLUDING GEOTHERMAL RESOURCES WITHIN THE MINERAL ESTATE: THE NEED FOR A STATUTORY RULE OF PRESUMPTION,
S. M. Farnsworth.
Brigham Young University Law Review, Vol 1978, No 3, p 593-616, 1978.

Descriptors: *Geothermal studies, *Energy conversion, *Resources development, Water policy, Water law, Judicial decisions, Energy, Legislation, Mineral industry, Natural resources.

Deciding whether a recently-found valuable resource is included within a general conveyance of all the mineral rights in a piece of property is not new to the courts. Near the turn of the century courts were asked to decide whether oil and gas were 'minerals' within the terms of deeds and leases. The difficulty in these cases arises because the term 'mineral' is used in so many senses. One

resource that has recently become valuable is geothermal energy. This increased interest in geothermal resources has raised the issue whether they belong to the mineral owner or to the surface owner. In determining these issues, courts can take different approaches: (1) constructional approach - examining the language used in the specific conveyance; or (2) functional approach - attempting to discern the intent of the parties by resorting to their general expectations regarding the use of their respective estates. While these approaches are effective, a preferable alternative would be a legislative determination of whether geothermal resources are presumptively included within the surface or the mineral estate. (Wilson-Florida)
W80-05088

ISLANDS AND THE DELIMITATION OF THE CONTINENTAL SHELF: A FRAMEWORK FOR ANALYSIS,
D. E. Karl.
American Journal of International Law, Vol 71, No 4, p 642-673, October 1977.

Descriptors: *Law of the Sea, *Continental Shelf, *Islands, International law, Boundaries(Surfaces), International commissions, Conferences, Foreign countries, Legal aspects, Analysis, United Nations.

One of the recurring problems in the law of the sea is the treatment of islands in the delimitation of the continental shelf between opposite and adjacent states. This issue has been magnified by developments at the Third United Nations Conference on the Law of the Sea, and in particular, by the adoption of equitable principles as the standard for delimitation of the continental shelf and exclusive economic zone between adjacent and opposite states. On the assumption that the content of these equitable principles may be derived from contemporary state practice in maritime delimitations, state practice is used to construct an analytical model of the continental shelf problem of islands. This model relies primarily on an island's relative location and secondarily on its relative size with respect to the delimiting states. It provides a framework for determining how an island should be treated in a given delimitation. The principles derived from this analysis will have an important bearing on the new problem of the delimitation of the exclusive economic zone. (Wilson-Florida)
W80-05089

WATER DELIVERIES UNDER THE RIO GRANDE COMPACT,
S. E. Reynolds, and P. B. Mutz.
Natural Resources Journal, Vol 14, No 2, p 201-205, April 1974.

Descriptors: *New Mexico, *Colorado, *Water allocation(Policy), Water control, Water resources, Water supply development, Water rates, Consumptive use, Water storage, Projects, *Rio Grande Compact.

This is a record of the water deliveries to and releases from project storage by Colorado and New Mexico under the Rio Grande Compact (Compact). Both Colorado and New Mexico have been in a debit status during most of the time the Compact has been in effect. Debit status means withdrawing more water than one has delivered to the project reservoirs. The practical effect of debit status has been to restrict the use of reservoirs constructed after 1937 in Colorado above Lobatos and after 1929 in New Mexico above San Marcial. The reasons for the debit status of these states and for reversing of this status are explored. As a result of New Mexico's and Colorado's debit status, Congress authorized a cooperative effort to rectify the Rio Grande channel and other works. Colorado has also been sued to enforce the Compact. By 1972 New Mexico liquidated her debit and Colorado established a definite trend toward credit status. (Daniels-Florida)
W80-05090

WRESTLING WITH WATER QUANTIFICATION IN WESTERN STATES,
G. Othmer.
Natural Resources Journal, Vol 14, No 3, p 423-430, July 1974.

Descriptors: *Water measurement, *Reservation doctrine, *Federal-state water rights conflicts, Water distribution(Applied), Water allocation(Policy), Federal government, Water policy, Water resource development, Water permits, Water utilization.

Nineteen states have adopted various types of state administered water distribution systems, attempting to achieve maximum efficiency in water usage. The practicalities of administration are complicated. The state water administrative bodies are plagued by one very unpredictable water user -- the United States Government. This obstacle to effective quantification by state government is an outgrowth of two decisions that have since been modified. These decisions stated that, whenever Congress sets land aside for a particular purpose, an unspecified quantity of water is reserved. The Federal Government hesitates to document the types of uses and the quantities of water it will use on federal land under state programs. The difficulty of the federal position is illustrated by comparing individual state reactions to classifying recreational or conservational uses as beneficial uses. Whether or not federal uses would be considered beneficial would be subject to nineteen interpretations. This uncertainty forces federal agencies into state proceedings which might inhibit planning and destroy valuable water rights. Some system of uniform reporting should be established to aid western states in water-use planning. A sample uniform federal form is suggested. (Daniels-Florida)
W80-05091

THE RAINBOW BRIDGE CASE AND RECLAMATION PROJECTS IN RESERVED AREAS,
J. B. Draper.
Natural Resources Journal, Vol 14, No 3, p 431-445, July 1974.

Descriptors: *Federal Project policy, *Reclamation, *Project planning, Federal government, Legislation, Projects, Water resources development, Environmental effects, Legal aspects, National parks, National monuments.

The following theory is tested: that an invasion of a reserved area, such as a national monument, by a reclamation project will be permitted by Congress when two or more projects threatening to invade different reserved areas are proposed to Congress simultaneously. In the Rainbow Bridge case, the court did not enjoin a reclamation project which resulted in an invasion of a national monument. The Rainbow Bridge decision and its impact as a political precedent are analyzed in order to test this theory against several other reclamations controversies involving reserved areas held by the federal government. There are only two multiple-project controversies against which the theory can be tested. The first involved the 1956 Colorado River Storage Act which resulted in the flooding of Rainbow Bridge. The second was the 1968 Colorado River Basin Project Act which authorized a reservoir in the Gila Wilderness. The theory advanced is valid, but some modifications should be made. Only when normal alternatives open to Congress are limited, and two or more projects are proposed simultaneously will an invasion of reserved areas be permitted. (Daniels-Florida)
W80-05092

SALINITY ASPECTS OF THE COLORADO RIVER AGREEMENT,
Texas Tech Univ., Lubbock.
H. E. Dregne.
Natural Resources Journal, Vol 15, No 1, p 43-53, January 1975.

Descriptors: *Colorado River Basin, *Water quality control, *Salinity, *Mexico, Colorado River, Treaties, Agriculture, Governmental interrelations, Financial feasibility, River basins, Water users, Water delivery.

The 1973 Colorado River agreement between Mexico and the United States is intended to resolve the conflict over the salinity of the river at the international boundary. Prior to this agreement, the United States had been pumping water of a high saline quality into Mexico as part of its allotment under treaty. Mexican agricultural interests protested, and the United States agreed to pump water of a satisfactory quality to Mexico and to maintain that quality. Although the dispute has been settled, the salinity problem in the river remains. Dam reservoirs and irrigation are major causes of the salinity problem, and future water development programs could lead to further degradation. Salinity control measures are now being undertaken to keep the salt content at acceptable levels. Problems with the agreement exist, including cost and the fact that the basin states were not made a part of the decision-making process. Modern technology can keep the salinity at acceptable levels, but success will not be easily achieved. (Tabano-Florida)
W80-05093

PORT AUTHORITIES VIEW STATE COASTAL MANAGEMENT PROGRAMS,
Maine Dept. of Transportation, Portland. Bureau of Waterways.
E. Langlois.
Coastal Zone Management Journal, Vol 2, No 2, p 171-176, 1975. 2 Fig.

Descriptors: *Port authorities, *Shore protection, *Economic impact, Planning, Development, Programs, Environmental engineering, Surveys, Harbors, Management, Coasts.

The American Association of Port Authorities conducted a survey among its member ports, to determine the extent of their interest and participation in the planning and implementation of their state coastal zone management programs. According to most port directors surveyed, a coastal zone management plan should provide the vehicle to balance economic development and environmental concerns. Introducing new and expensive facilities into existing ports requires extensive waterfront property acreage. Permits must be obtained for dredging in waterways and disposing of spoils. Environmental impact statements must be prepared. This concern for the environment is growing along with the development of new legislation, policy, guidelines, and regulations at all levels of government. The federal Coastal Zone Management Act (Act) has added a new dimension to the thinking of the port authority director. Port directors wonder how the need for ports and commerce fits into coastal planning programs. Twenty-three ports have assigned personnel to work with state planners in implementing the Act. Thirty ports have growth plans ready for implementation or on the drawing boards. (Wilson-Florida)
W80-05094

SOME LEGAL ISSUES IN THE COASTAL ZONE MANAGEMENT ACT: GRANT-IN-AID ASPECTS - PART ONE,
Wisconsin Univ. Madison.
Z. L. Zile.
Coastal Zone Management Journal, Vol 3, No 1, p 30-70, 1976.

Descriptors: *Grants, *Coasts, *Shore protection, *Federal-state water rights conflicts, Federal government, Legislation, Administrative agencies, Legal aspects, Regulations, Administration, Management, State governments.

There are potentially troublesome legal issues deriving from the nature of the Coastal Zone Management Act (Act) as a grant-in-aid measure. The tension between federal and state perceptions of the coastal realities are explored. This tension may result in nonutilization of underutilization of the Act. Several agency strategies are hypothesized and evaluated as a means for bridging the gap. Questions associated with grant awards, program approval and termination of assistance are surveyed. Occasional conflicts between the granting agency and the recipient may reach litigation stage, especially due to the intervention of politically active third parties. The legal nature of grants procedural guarantees, judicial review and stand-

ing requirements of third parties are analyzed. Principles of general administrative law are applied to specific situations envisioned by the Act and its implementing regulations. Conclusions and recommendations are made in the second part of this article. (Daniels-Florida)
W80-05095

SOME LEGAL ISSUES IN THE COASTAL ZONE MANAGEMENT ACT: GRANT-IN-AID ASPECTS - PART TWO,
Wisconsin Univ.-Madison.
Z. L. Zile.
Coastal Zone Management Journal, Vol 3, No 2, p 151-169, 1977.

Descriptors: *Coasts, *Land use, *Shore protection, Administrative agencies, State governments, Federal government, Administration, Grants, Participating funds, Legal aspects, Management, Legislation.

Legal issues regarding compliance with grant conditions and participation in the development of coastal management programs are considered. Assistance under the Coastal Zone Management Act (Act) is in the form of conditional grants. The granting agency is obligated, in principle, to secure compliance with the grant conditions. Most administrative review of grantee performance occurs in the day-to-day work process. The presence of Congressional review is an incentive. The Act, the implementing regulations and the grant instruments provide mechanisms to cope with most contingencies. Lax enforcement of grant conditions can invite third-party intervention, robbing the granting agency of some of its initiative and control over the dispute settlement process. Participation in coastal management programs is developed in numerous legal guarantees, invitations and procedures. Some uncertainty remains as to whether the words can be translated into action approximating what was intended. The loose standards for participation might be used by parties pursuing diverse objectives to impede coastal zone management. (Daniels-Florida)
W80-05096

STATE REVIEW OF LOCAL LAND-USE DECISIONS: THE CALIFORNIA COASTAL COMMISSIONS,
California Univ., Davis.
P. Sabatier.
Coastal Zone Management Journal, Vol 3, No 3, p 255-290, 1977. 8 Tab.

Descriptors: *California, *Land use, *Shore protection, Permits, Legal aspects, Decision making, Reviews, Coasts, Land development, Local governments, Legislation.

The California Coastal Zone Conservation Commissions have been required to review virtually all development projects approved by local government within approximately 1000 yards of the coast. Ninety-seven percent of all permits were approved in some fashion by the regional commissions. Examined are the 4% of regional commission decisions that were significant or controversial enough to be appealed to the State Commission in the first 2 1/2 years of the permit review program. The regional commissions imposed conditions on or denied more than 50% of the projects subsequently appealed to the State Commission. The State Commission held even more restrictive views of permissable development. There are a number of reasons for the more restrictive state view, including differences in policy, the presence of state-appointed commissioners, and the willingness of environmental groups to become actively involved in the appellate process. All are necessary conditions for obtaining comparably stringent policy outputs. (Daniels-Florida)
W80-05097

FLORIDA AND COASTAL ZONE MANAGEMENT,
J. R. Brindell.
The Florida Bar Journal, Vol 54, No 4, p 295-299, April 1980.

Descriptors: *Florida, *Coasts, *Shore protection, Federal government, State government, Legislation, Management, Resources development, Resources, Programs.

Florida has an interrelationship between land and coastal waters more extensive than that of any other state. The magnetism of these natural features has created Florida's most fundamental dilemma -- how to maintain the benefits of our coastal resource and maximize individual freedom of choice, without destroying the benefits. On a national level, the 1972 Coastal Zone Management Act (CZMA) was enacted to deal with this dilemma. CZMA calls for non-compulsory state participation in the federal management program. The Florida legislature passed the 1978 Florida Coastal Management Act (FCMA) directing a state program, based upon existing state laws and regulations, be submitted to the federal government for approval. The focus of the state program is a refinement of current management and regulatory schemes so that Florida's coastal resources will be effectively managed. The current effort provides a timely and useful framework within which Florida can significantly improve resource management. (Daniels-Florida)
W80-05100

6F. Nonstructural Alternatives

WATER LEGISLATION PERSPECTIVES FOR ALABAMA,
Alabama Univ., University.
For primary bibliographic entry see Field 6E.
W80-04934

MANAGING RECREATIONAL RIVERS,
National Association of Attorneys General, Raleigh, NC.
For primary bibliographic entry see Field 6E.
W80-04935

PROTECTING AQUIFERS FOR THE FUTURE.
Ground Water Age, Vol 14, No 6, p 26-27, 30, 32, February, 1980.

Descriptors: *Municipal water, *Water pollution control, *Aquifers, *Planning, Buried valley aquifer, Massachusetts, Water zoning, Land use, Local governments, Non-structural alternatives, Suburban areas, Surveys, Mapping, *Aquifer management.

Stow, Massachusetts, which depends on private wells for its water supply, hired an environmental planning firm to map major aquifers and recharge areas and make recommendations to protect and preserve its ground water. This resulted in the formation of an aquifer protection district, adoption of new zoning laws, changes in current zoning practices relating to septic systems and housing density, and identification of proper areas for industrial and commercial development, road salting and possible future municipal well fields. (Purdin-NWWA)
W80-04948

FLOOD CONTROL AND ARIZONA,
For primary bibliographic entry see Field 6E.
W80-05078

6G. Ecologic Impact Of Water Development

FORESTS AND FLOODING WITH SPECIAL REFERENCE TO THE WHITE RIVER AND OUACHITA RIVER BASINS, ARKANSAS,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2I.
W80-04854

SIMULATION OF WETLANDS FOREST VEGETATION DYNAMICS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2I.
W80-04860

ESTUARINE SANCTUARIES - THE OREGON EXPERIENCE,
For primary bibliographic entry see Field 6E.
W80-04922

SAVING CALIFORNIA'S COAST: THE COASTAL ZONE INITIATIVE AND ITS AFTERMATH,
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6E.
W80-04924

AN ANALYSIS OF THE OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1978,
Nossaman, Waters, Krueger, Marsh and Riordan, Los Angeles, CA.
For primary bibliographic entry see Field 6E.
W80-04962

OBSTACLES TO GEOTHERMAL DEVELOPMENT,
For primary bibliographic entry see Field 5C.
W80-04983

THE PRESSURE FOR SHORELINE DEVELOPMENT: SPATIAL CONCEPTS IN REVIEW,
Ottawa Univ. (Ontario).
For primary bibliographic entry see Field 6E.
W80-04991

STATE AND LOCAL WETLANDS REGULATION IN THE COURTS: CONSTITUTIONAL PROBLEMS ON THE WANE,
For primary bibliographic entry see Field 6E.
W80-04997

FEDERAL CONTROL OF WETLANDS: THE EFFECTIVENESS OF CORPS' REGULATIONS UNDER SECTION 404 OF THE FWPCA,
For primary bibliographic entry see Field 6E.
W80-05005

A PRELIMINARY FEASIBILITY STUDY TO IRRIGATE WESTERN UMATILLA AND NORTHEASTERN MORROW COUNTIES, OREGON.
Oregon Dept. of Water Resources, Salem.
September 1975, 30 p, 12 Maps.

Descriptors: *Irrigation, *Columbia River, *Feasibility studies, Oregon, Irrigation districts, Reservoirs, History, Dams, Canals, Wells, *Umatilla Co.(OR), *Morrow Co.(OR).

Twelve alternative plans are presented for irrigation of west Umatilla and northeast Morrow Counties (OR), using water pumped from the Columbia River. Each plan is divided geographically, with initial and annual costs for each segment given separately. At present, about 20,000 acres in the area are irrigated from wells; withdrawal of ground water is greater than recharge. The Stanfield and Westland Irrigation districts currently obtain their water supply from spring runoff in the Umatilla River with storage at McKay Reservoir. A rate of nine gal/min/acre was used in the study as a peak irrigation requirement, except for plans 10 and 12. The 12 alternatives are: (1) irrigation water provided to the entire 79,700-acre area from a point on the river below Umatilla, using pipelines and canals to irrigate higher elevations; (2) same as no. (1) except only pipelines used for higher elevations; (3) 65,340 acres west of Umatilla River from below Umatilla; (4) 75,262 acres; Butter Creek area excluded; (5) 50,905 acres; higher areas excluded; (6) 15,000 acres currently irrigated plus 31,468 acres in Stanfield-Westland; (7) 6,510 acres currently irrigated plus 7,850 acres in Stanfield from a point below Hat Rock State Park; (8) same as no.

(7) excluding 6,510 acres; (9) 60,592 acres west of Umatilla River from below Umatilla; (10) same as no. (9) except seven gal/min/acre; (11) 79,700 acres from below Hat Rock Park; (12) same as no. (11) except five gal/min/acre. (Lynch-Wisconsin)
W80-05017

7. RESOURCES DATA

7A. Network Design

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1978 WATER YEAR,
Geological Survey, Little Rock, AR. Water Resources Div.
R. K. Knott.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO 80225, Paper copy $2.25, Microfiche $3.50. Geological Survey open-file report 79-1349, 1979. 17 p, 2 Tab.

Descriptors: *Discharge measurement, *Network design, *Water quality, *Monitoring, *Stations, Arkansas, Streams, Data collections, Streamflow, Flow rates, Stage-discharge relations, Gaging stations, *U.S. Geological Survey, *U.S. Army Corps of Engineers.

Discharge data were computed for a network of water-quality monitoring stations operated throughout Arkansas by the Arkansas Department of Pollution Control and Ecology. Each site is numbered and described. Some of the sites are located at U.S. Geological Survey or U.S. Army Corps of Engineers daily-discharge stations, but most are at points where discharges are not regularly measured. Data were obtained as follows: (1) For sites located at gaging stations, discharges were obtained from Geological Survey and Corps of Engineers annual publications; (2) for sites not too distant from gaging stations, discharges were estimated by using gaging-station records; and (3) for other sites, a series of discharge measurements were made at each site to define a stage-discharge curve from which discharge was computed. Discharges on days of sampling were determined for about 90 of the sites. A tabular summary for the water year 1978 is given. Several discharges for miscellaneous dates in the 1977 water year are shown. (Kosco-USGS)
W80-04851

EPA CONSOLIDATION OF PERMITS PROPOSAL-REGULATORY WORKHORSE OR BUREAUCRATIC NIGHTMARE,
Water Pollution Control Federation, Washington, DC.
For primary bibliographic entry see Field 6E.
W80-05037

NEW NATIONWIDE HYDROLOGIC INVESTIGATIONS.
For primary bibliographic entry see Field 6A.
W80-05099

7B. Data Acquisition

ORGANIC SOLUTE-MINERAL SURFACE INTERACTIONS: A NEW METHOD FOR THE DETERMINATION OF GROUNDWATER VELOCITIES,
Indiana Univ. at Bloomington.
P. Ciccioli, W. T. Cooper,, P.M. Hammer, and J. M. Hayes.
Water Resources Research, Vol 16, No 1, p 217-223, February 1980. 5 Fig, 1 Tab, 16 Ref. ORNL (Sub. 7031) W-7405-ENG-26.

Descriptors: *Groundwater movement, *Tracers, *Organic compounds, *Velocity, Solutes, Surfaces, Polarity, Adsorption, Groundwater, Measurement, Mass transfer, Equipment, Halocarbons, Multiple tracer procedure.

When the adsorption processes affecting the migration rates of organic solutes in groundwater systems are considered in detail, it can be shown that the use of multiple tracers should allow accurate calculation of the groundwater velocity even when all the tracers are retarded to some extent by interactions with mineral surfaces in the aquifer and even when the extent of that retardation is not known beforehand. It should be required only that the tracers be members of a series of compounds whose surface interaction energies vary regularly, this condition being met, for example, by compounds in the series C2ClnF(6-n). Experimental studies aimed at testing this concept show that two series of tracers behave as expected on laboratory columns (limestone and sand), thus indicating the fundamental validity of the approach. Further, the nature of the interactions between the mineral surfaces and the tracer molecules can be shown in these cases, at least, to be nonspecific, the strength of the interaction depending only on the polarizability of the tracer molecule. It seems likely that other satisfactory tracers can be selected using this criterion and that the approach should be applicable even to systems involving many different mineral surface types. (Visocky-ISWS)
W80-04827

DEVELOPMENT OF A SELF-SEALING SAMPLER FOR EPHEMERAL WADI FLOODS,
Ben Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Desert Research.
M. Levin, E. Adar, and A. Barzilai.
Water Resources Research, Vol 16, No 1, p 245-249, February 1980. 5 Fig, 1 Ref.

Descriptors: *Sampling, *Floods, *Deserts, *Intermittent streams, Equipment, Instrumentation, Design, Precipitation(Atmospheric), Rainfall, Flash floods, Hydrology, Flood samplers.

The sampling of random floods for the analysis of environmental isotopes in flood water is handicapped by the fact that this water may partially evaporate between the time of the flood and the actual collection of the sample. Conventional methods of sampling are frequently ineffective, as floods occur at random both in time and space. With these considerations in mind, an instrument that enables automatic sampling of flood water was designed and built. The sample is hermetically sealed, and secondary effects that could change the original sample in any way are thus avoided. (Sims-ISWS)
W80-04830

EXPERIMENTAL DETERMINATION OF THE VELOCITY GRADIENT IN TWO DIMENSIONAL TURBULENT FLOW,
Vanderbilt Univ., Nashville, TN.
For primary bibliographic entry see Field 8B.
W80-04836

A NEW MEASURING DEVICE FOR QUICKLY VARYING LIQUID LEVELS (PRINCIPE D'UN NOUVEAU DISPOSITIF DE MESURE DES NIVEAUX DE LIQUIDES),
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de Mecanique des Fluides.
J. Piquemal, and J. J. Barrau.
Journal of Hydraulic Research, Vol 18, No 1, p 83-86, 1980. 4 Fig.

Descriptors: *Water levels, *Measurement, *Instrumentation, *Interfaces, Light, Cathodes, Laboratory equipment, Stratified flow, Reflectance, Optical properties, Free surfaces, Flow, Nonmiscible fluids.

A light point can be visualized upon the partition surface of two fluids. An optical system can follow the displacement of this point. The advantages of this system are: (1) the noncontacted probing that does not disturb the flow, (2) very high band pass, and (3) measurement can be realized when classical systems are unsuited (nonconductor fluids, stratified flow interface with nonmiscible fluids). (Humphreys-ISWS)
W80-04839

PYRANINE USED AS A FLUORESCENT TRACER IN HYDROLOGY: PH EFFECTS IN DETERMINATION OF ITS CONCENTRATION,
CEA Centre d'Etudes Nucleaires de Grenoble (France).
M. Launay, M. Tripier, J. Guizerix, M. L. Viriot, and J. C. Andre.
Journal of Hydrology, Vol 46, No 3/4, p 377-383, April 1980. 2 Fig, 2 Tab, 9 Ref.

Descriptors: *Tracers, *Fluorescent dye, *Laboratory tests, *Analytical techniques, Dyes, *Hydrogen ion concentration, Streamflow, River flow, On-site investigations, Dye releases, Hydrology, Fluorescence, *Pyranine, Excitation, Buffering.

Pyranine is used as a fluorescent tracer in hydrology; but this compound which may exist under several ionic forms has, for a given concentration, a fluorescence emission which depends strongly on the pH. A simple method was proposed for the measurement of fluorescence intensity of the tracer by buffering solutions at fixed pH values: pH 10 (excitation at 450 nm, emission at 515 nm) or pH 5 (excitation at 403 nm, emission at 515 nm). In both cases, the limit of detection is close to 4 x 10 to the minus 10th power g/g. (Sims-ISWS)
W80-04846

DETERMINATION OF TRACE ELEMENTS IN NATURAL WATERS BY THE D.C. ARGON PLASMA, MULTIELEMENT ATOMIC EMISSION SPECTROMETER (DCP-MAES) TECHNIQUE,
Colorado State Univ. Fort Collins. Dept. of Chemistry.
G. W. Johnson, H. E. Taylor, and R. K. Skogerboe.
Spectrochimica Acta, Vol 34B, p 197-212, 1979. 7 Fig, 10 Tab, 14 Ref.

Descriptors: *Trace elements, *Natural streams, *Surface waters, *Groundwater, *Evaluation, Analytical techniques, Spectrometers, Instrumentation, Chemical analysis, *Atomic emission spectrometry.

The capabilities and limitations of a commercial direct current argon plasma, multielement atomic emission spectrometric (DCP-MAES) technique for the determination of 18 common elements in water have been evaluated. The results demonstrate that the unit offers acceptable capabilities with respect to selectivity, sensitivity, accuracy, speed and economy for the determination of many of the elements investigated. Interferences in the determinations of those elements subject to stray light due to the presence of calcium and (or) magnesium can often be compensated for by use of a simple linear correction procedure. A comparison of two-electrode and three-electrode d.c. argon plasma systems has shown that the latter offers advantages such as improved stability and lower background. A comparison with results published for a system based on excitation in an inductively coupled plasma has indicated that the present system offers comparable analytical capabilities for several of the elements investigated. (Kosco-USGS)
W80-04858

THE USE OF THE CLIMATIC WATER BUDGET TO EVALUATE THE VALIDITY OF A PRECIPITATION RECORD,
Delaware Univ., Newark. Dept. of Geography.
J. R. Mather, and C. M. Rowe, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182157, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, University of Delaware, Technical Research Report, 1979. 25 p, 10 Fig, 4 Tab, 12 Ref, 3 Append. OWRT A-040-DEL(5), 14-34-0001-9008.

Descriptors: *Water balance, *Hydrologic budget, *Precipitation(Atmospheric), *Climatology, *Runoff, Industrial water, Inflow, Flow rates, Correlation analysis, Water management, Indiana, La Porte area(Ind).

From 1927 to 1963 the precipitation recorded at La Porte, Indiana about 30 miles southeast of the

Chicago-Gary industrial complex was significantly higher than the precipitation found at any nearby station. Two reasons have been suggested for this anomaly. The first assumes that the record is correct and suggests that industrial pollution has resulted in increased downwind precipitation amounts. The second assumes that the record is incorrect and is merely the result of instrumental or observer error. This report describes the use of the climatic water budget to determine the more likely conclusion. Values of runoff were computed from climatic data from La Porte as well as from South Bend, and Plymouth, Indiana, the stations nearest to La Porte. The computed runoff values from South Bend and Plymouth were most closely correlated with the anomalously high precipitation could have occurred in a cylinder only 1.37 miles in radius centered over La Porte, without significantly changing basin runoff. Such a small area of anomalously high precipitation would seem unlikely to occur as a result of industrial pollution. The water budget, thus, suggests that observer error is a more realistic suggestion than industrial pollution for the La Porte anomaly.
W80-04877

MICHIGAN JOB USES GEOPHYSICAL AIDS,
UOP, Inc., St. Paul, MN. Johnson Div.
W. L. Anderson.
Johnson Driller's Journal, Vol 51, No 6, p 2-4, 9, November-December, 1979. 3 Fig.

Descriptors: *Gravity studies, *Subsurface investigations, *Glacial aquifers, Michigan, Gravimeters, Digital computers, Bedrock, Valleys, Lake sediments, Ground water, Municipal water, Water supply, Remote sensing, Geophysics.

A gravity survey of a glacial drift area in and around Munising, Michigan used a La Coste and Romberg Model G gravimeter and a CDC digital computer to adjust data for effects of latitude, elevation, etc. Results of the survey indicated that an extensive buried valley existed beneath the city with an estimated overburden thickness of 200 feet. The presence of highly permeable lake sands throughout the area suggested that the valley fill might consist principally of permeable glacial deposits. Subsequent drilling and aquifer testing confirmed this hypothesis. (Purdin-NWWA)
W80-04943

PRECISION DRILLING FOR DAM SAFETY.
For primary bibliographic entry see Field 8A.
W80-05055

7C. Evaluation, Processing and Publication

INTERVENTION ANALYSIS WITH MISSING DATA,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier.
Water Resources Research, Vol 16, No 1, p 159-171, February 1980. 5 Fig, 6 Tab, 12 Ref, 1 Append. NRC AT(49-24)-022.

Descriptors: *Estimating equations, *Time series analysis, *Model studies, *Mathematical models, Data processing, Data collections, Meteorological data, Hydrologic data, Water quality, Water pollution, Environment, Statistics, Monte Carlo method, Analytical techniques, Missing data, Missing data estimation, Intervention analysis.

Intervention analysis is a potentially useful tool for modeling time series when the process mean undergoes changes as the result of an external perturbation. The utility of the technique for water resource applications is, however, limited by the requirement that the data be collected uniformly in time. Two approaches for estimating missing data, one of which provides minimum variance estimates when model parameters are known, and a computationally simpler approximation were investigated. The approximation was found to be quite adequate and was incorporated in a practical scheme to estimate missing data and model parameters simultaneously. Subsequently, a method for estimating the parameter variance for use in significance tests on the intervention magnitude was investigated. The adequacy of the approximation was assessed in a series of Monte Carlo tests using three models consisting of step, linear, and impulse decay trends in mean with residual lag 1 Markov noise. Results of the experiments indicated that the suggested method provides adequate estimates of the variance of the intervention magnitude of the step and impulse decay models but that the variance was substantially overestimated for the linear model. However, for the same proportion of missing data the accuracy of the approximation improved as the sample size increased. (Sims-ISWS)
W80-04823

TECHNIQUES FOR EXPLORING AND PRESENTING DATA APPLIED TO LAKE PHOSPHORUS CONCENTRATION,
Michigan State Univ., East Lansing. Dept. of Resource Development.
K. H. Reckhow.
Canadian Journal of Fisheries and Aquatic Sciences, Vol 37, No 2, p 290-294, February 1980. 2 Fig, 3 Ref. NOAA 03-78-B01-109.

Descriptors: *Water quality, *Phosphorus, *Lakes, *Data processing, Statistics, Model studies, Analytical techniques, Data collections, Limnology, *Data presenting.

Water quality sampling and data analysis are undertaken to acquire and convey information. Therefore, when data are presented, the form of this presentation should be such that information transfer is high. For example, a graph or table of average values is often an inadequate summary of batches of data. As an alternative, a technique was presented (that was developed for exploratory data analysis purposes) that can be used to display several sets of data on a single graph, indicating median, spread, skew, size of data set, and statistical significance of the median. This technique is useful in the study of phosphorus concentration variability in lakes. Additions to, and modifications of, this procedure are easily made and will often enhance the analysis of a particular problem. Some suggestions were made for useful modifications of the plots in the study and display of phosphorus lake data and models. (Sims-ISWS)
W80-04843

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 2A-1. SOUTH FLORIDA SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-142797, Price codes: A14 in paper copy, A01 in microfiche. Geological Survey Water-Data Report FL-78-2A-1, November 1979. 293 p, 14 Fig, 1 Tab, 9 Ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, Gaging stations, Streamflow, Flow rates, Sediment transport, Lakes, Reservoirs, Data collections, Sites, *South Florida, Lake elevations.

Water resources data for the 1978 water year for South Florida includes discharge records for 78 streams, stage-only records for 65 streams, elevations for 19 lakes, miscellaneous measurements, and crest-stage partial records for 6 streams. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State, and Federal agencies in Florida. (Kosco-USGS)
W80-04847

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 2A-2. SOUTH FLORIDA SURFACE WATER QUALITY.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-142805, Price codes: A99 in paper copy, A01 in microfiche. Geological Survey Water-Data Report FL-78-2A-2, November 1979. 711 p, 4 Fig, 1 Tab, 9 Ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Sediment transport, Water analysis, Water temperature, Chemical analysis, Data collections, Sites, *South Florida.

Water resources data for the 1978 water year for South Florida includes water quality data for approximately 290 surface water sites. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State, and Federal agencies in Florida. (Kosco-USGS)
W80-04848

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 2B. SOUTH FLORIDA GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-141914, Price codes: A99 in paper copy, A01 in microfiche. Geological Survey Water-Data Report FL-78-2B, November 1979. 602 p, 18 Fig, 1 Tab, 9 Ref.

Descriptors: *Florida, *Hydrologic data, *Groundwater, *Water quality, Water analysis, Water temperature, Chemical analysis, Water wells, Water levels, Data collections, Sites, *South Florida.

Water resources data for the 1978 water year for South Florida include water level measurement for 299 wells and water quality for 500 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State, and Federal agencies in Florida. (Kosco-USGS)
W80-04849

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1978--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-134364, Price codes: A99 in paper copy, A01 in microfiche. Geological Survey Water-Data Report FL-78-4, October 1979. 731 p, 45 Fig, 1 Tab, 9 Ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northwest Florida.

Water resources data for the 1978 water year in Florida consist of discharge records for 295 streams, stage-only records for 206 streams, elevations for 216 lakes, water level measurements for 1134 wells and crest-stage partial-records for 54 streams. Water quality data for approximately 550 streams or lakes and 1050 wells are included. The data in this volume for Northwest Florida includes discharge records for 69 streams, elevations for 27 lakes, water-level measurements for 94 wells, crest-stage partial records for 25 streams, water-quality data for 50 streams and 110 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Kosco-USGS)
W80-04850

WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NYE COUNTY, NEVADA 1976-77,
Geological Survey, Carson City, NV. Water Resources Div.
For primary bibliographic entry see Field 4B.
W80-04853

WISCONSIN, A SUMMARY OF ACTIVITIES AND PLANS OF THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, 1979.

Geological Survey, Madison, WI. Water Resources Div.
Geological Survey Wisconsin District report, 1979. 81 p.

Descriptors: *Wisconsin, *Projects, *Water resources, *Geological Survey, *Land resources, Mineralogy, Water resources development, Hydrologic data, Floods, Sediment transport, Streamflow, Low flow, Groundwater resources, Aquifer characteristics, Water quality, Mapping, Publications, Bibliographies, Reviews.

The U.S. Department of the Interior's Geological Survey, established in 1879, is the Nation's principal fact-finding agency concerned with physical resources--the configuration and character of land surface, the composition and structure of the underlying rocks, and the quality, extent, and distribution of water and minerals. The Survey is an impartial fact-finding and research agency that gathers and interprets data so that managers can make decisions based on objective information. The Wisconsin program of the U.S. Geological Survey is, for the most part, planned and funded with local and State agencies through cooperative programs. This booklet will be useful to cooperating agencies by providing an understanding of all current studies and identifying present and future resource problems that are relevant to the experience and competence of the Survey in Wisconsin. (Kosco-USGS)
W80-04859

KNIK GLACIER, ALASKA, MAY 1979 MONUMENT AND GLACIER SURVEY,
Geological Survey, Fairbanks, AK. Water Resources Div.
D. C. Trabant, and L. R. Mayo.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO 80225, Paper copy $6.50, Microfiche $4.50. Geological Survey open-file report 80-48, 1979. 20 p, 3 Fig, 2 Plates, 7 Tab, 4 Ref.

Descriptors: *Glaciers, *Alaska, *Surveys, *Lakes, *Dams, Ice, Dam failure, Floods, Forecasting, Measurement, Altitude, Maps, Analytical techniques, Data collections, *Knik Glacier(Alaska).

From 1915, or earlier, to 1966, with the exception of 1963, Knik Glacier annually formed and released Lake George, the largest glacier-dammed lake in Alaska. Eleven geodetically controlled survey stations were defined in the basin, and 22 glacier surface altitudes were measured. This is the first effort in a continuing program whose goal is predicting the future behavior of Knik Glacier and Lake George. (Kosco-USGS)
W80-04863

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING WELL DENSITY IN THE GROUND-WATER SUBUNITS AND AREAS,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
J. C. Faughn.
Available from: OFSS Box 25425, Fed. Ctr. Denver, CO 80225, Paper copy $4.75, Microfiche $0.50. Geological Survey open-file map 79-1298, 1979. 1 Sheet.

Descriptors: *Maps, *Water wells, *Water levels, *Aquifers, California, Antelope Valley-East Kern Water Agency area, *Groundwater subunits.

A map (scale, 1:125,000) shows ground-water subunits and areas and the density of wells in the Antelope Valley-East Kern Water Agency areas, California. (Kosco-USGS)
W80-04865

GROUND WATER FLOW COMPUTATIONS BY METHOD OF LINES,
Florida Univ., Gainesville. Hydrology Lab.
A. D. Koussis, and R. W. Watson.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 106, No 1R1, p 1-8, March, 1980. 3 Fig, 10 Ref.

Descriptors: *Ground water movement, *Numerical analysis, *Method of Lines, Equations, Aquifers, Water table, Approximation method, Seepage.

Numerical integration by Methods of Lines is applied to general conditions of two-dimensional unconfined ground water flow. According to this method, the original partial differential equation (PDE) is converted to a set of coupled ordinary differential equations (ODE) by discretizing in one of the independent variables while keeping the other continuous. The set of ODE thus obtained can be solved by techniques more efficient and powerful than those available for solving PDE. The method was found to be versatile, efficient, and easy to program using a variety of established methods for the solution of ODE. Higher order approximations to the derivations can be easily introduced, thus improving the convergence towards the true solution and enabling the solution to be carried out on a programmable hand-held calculator. The Method of Lines is also capable of handling water table profiles of various shapes as initial conditions, and other problems such as seepage flow over an inclined impervious layer. (Purdin-NWWA)
W80-04950

FLOW NETS BY THE FINITE ELEMENT METHOD,
Stone and Webster Engineering Corp., Boston, MA.
J. T. Christian.
Ground Water, Vol 18, No 2, p 178-181, March-April, 1980. 4 Fig, 9 Ref.

Descriptors: *Flow nets, *Finite-element analysis, *Computer models, Potential flow, Sheet piling, Wells, Earth dams, Anisotropy.

This paper describes how conventional finite element analyses of steady-state flow in porous media are extended to develop values of the stream function and how the resulting potential and stream function are contoured to give both plane and radial flow nets. This procedure does not apply to multiple connected regions or to regions with internal sinks or sources. Four examples are provided to illustrate the use of the method and the results obtained. They are: (1) flow beneath a sheet pile wall; (2) radial flow toward a well which is fully cased and open only at the bottom; (3) flow through an earth dam composed of two materials; (4) and flow in an anisotropic medium. In all four cases, there is close agreement between hand solutions and computer solutions. (Purdin-NWWA)
W80-05058

8. ENGINEERING WORKS

8A. Structures

DEEP EXCAVATION IN PUERTO RICO IS DEWATERED,
Paniagua, Rodriguez, Garcia and Crumley, San Juan, PR.
For primary bibliographic entry see Field 8B.
W80-04944

DIFFERENCES SEEN IN OIL AND WATER WELL DRILLING,
UOP, Inc., St. Paul, MN. Johnson Div.
R. E. Allred.
Johnson Driller's Journal, Vol 51, No 6, p 7-8, November-December, 1979. 1 Fig.

Descriptors: *Water wells, *Oil wells, *Technology, Design, Construction, Well screens, Depth, Drilling, Gravel packing, Corrosion, Production.

Similarities and differences between oil and water well drilling are examined. Both use direct rotary drilling methods, but while water well rigs can drill to 2000 feet, the much larger oil well rigs can drill more than 10 times as deep. The technique of directional drilling is commonly used for oil wells but is not usually necessary for water wells. Oil wells that produce from more than one zone require sealed packers and separate production tubing whereas multiple-aquifer water wells are simply screened through each production interval. Methods of casing, cementing, and gravel packing in the wells can also differ. In very deep holes, oil production zones might be left uncased. During gravel packing of oil wells, cross-over tools are used in placing the gravel around the production screen. The size of this gravel is 10 to 12 times the formation size while water well design criteria call for gravel 5 to 6 times formation size. The corrosive environment and high temperatures of deep oil wells requires corrosion-resistant casing and screen. Two types of screen are manufactured for oil wells: a rod-base (pipeless) screen for maximum hydraulic efficiency and a pipe-base screen for maximum strength. (Purdin-NWWA)
W80-04945

AN ECCENTRIC REDUCER WAS THE ANSWER,
UOP, Inc., Thorofare, NJ. Johnson Div.
J. S. Miller.
Johnson Driller's Journal, Vol 51, No 6, p 8-9, November-December, 1979. 1 Fig.

Descriptors: *Water wells, *Repairing, *Joints(Connections), Well screens, Cooling water, Borehole cameras.

Extensive sand pumping in a well supplying cooling water was thought to be due to a break in the casing or screen. A downhole camera survey revealed that the screen and riser had been run without centering guides, and the riser had been sealed to the casing off center with a lead shot. A new liner screen was installed by using an eccentric reducer which centered the screen on the riser. (Purdin-NWWA)
W80-04965

EFFLUENT DISPOSAL METHODS,
Delta Well Co., Inc., Ronkonkoma, NY.
R. Schockley.
Ground Water Heat Pump Journal, Vol 1, No 1, p 27-28, Spring, 1980. 2 Fig.

Descriptors: *Injection wells, *Waste water disposal, Effluents, Cooling water, Design, Well spacing, Piping systems(Mechanical), Maintenance, Rehabilitation, Heat pumps, Ground water, Heating, Cooling.

The most common method of disposal of heat pump effluent is through injection wells. Injection wells should be designed for twice the capacity of the supply well, and a slight backpressure. Periodic maintenance and redevelopment should be performed. The injection well should be located downgradient from the supply well and at a far enough distance to avoid thermal interaction between the two wells. The proper design of the piping system includes installation of a filter and a pressure gauge in the injection line, and a connection to the injection well that provides full access to the well for development. Reversing the flow in summer and winter results in automatic redevelopment of the injection well. (Purdin-NWWA)
W80-05019

PRECISION DRILLING FOR DAM SAFETY.
Ground Water Age, Vol 14, No 8, p 37-38, April, 1980.

Descriptors: *Rotary drilling, *Foundations, *Bench marks, Surveying instruments, Dams, Safety.

The Test Drilling Service Company was contracted by the U.S. Army Corps of Engineers to drill precise foundation holes for dam survey monuments in the alluvial region around the Mississippi River and its tributaries. The drilling crew switched from air rotary to mud rotary drilling when they encountered layers of unconsolidated till and a loose gravel aquifer just above bedrock. The mud pump was modified to operate with compressed air. Hole deviation was kept within one percent of vertical, using a roller stabilizer right behind the bit. With a fixed monument, the

Corps believes that trilateration surveys will provide unprecedented precision in determining very small movements in dam and lock structures, and thus, an important advance in dam safety survey methodology. (Purdin-NWWA)
W80-05055

IMPROVING YIELDS OF OPEN WELLS IN CONSOLIDATED ROCKS USING EXTENSION DRILLING TECHNIQUES,
Geraghty and Miller, Inc., Annapolis, MD.
V. W. Uhl, Jr.
Ground Water, Vol 18, No 2, p 175-177, March-April, 1980. 2 Fig, 1 Tab.

Descriptors: *Drilling, *Dug wells, *Irrigation wells, Water wells, Water yield improvement, India, Water table aquifers, Bedrock, Technology, Economics, Feasibility.

Recent demands for increased food production in India have required improving yields of irrigation wells using extension drilling. This technique consists of drilling 1.5 to 2-inch diameter holes to depths of 50 feet starting at or near the bottom of hand-dug open wells in consolidated rock. This is accomplished using a drilling system composed of a jack hammer, drill rods, and tungsten carbide bits powered by compressed air. Air or water is passed through the hollow drill rods to flush cuttings from the hole. Before drilling, the open well is dewatered using a sump pump. If a vertical hole is to be drilled, a few feet of 2.5-inch diameter casing are installed and drilling is then carried out using a 1.5 to 2-inch diameter bit. The optimum location for drilling in open wells in shallow water table aquifers is at topographic low areas or ground water discharge areas where hydraulic potentials increase with depth, and where fracturing is usually more intensive. Extension drilling is both technologically and economically feasible for farmers owning medium to small size (1 to 10 acres) farms. (Purdin-NWWA)
W80-05057

USING NONMETALLIC CASING FOR GEOTHERMAL WELLS,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8G.
W80-05063

BACTERIA: WHAT'S IN THE WATER.,
National Water Well Association, Worthington, OH.
S. Smith.
Water Well Journal, Vol 34, No 4, p 88-89, April, 1980.

Descriptors: *Bacteria, *Water pollution treatment, *Ground water, Iron bacteria, Sulfur bacteria, Coliforms, Chlorination, Water pollution sources, Disinfection, Water analysis, Testing procedures, Pathogenic bacteria, *Well spacing, *Well casings.

Proper location and construction of wells will help prevent ground water pollution. Lack of horizontal distance from a potential source of contamination can be compensated for by drilling to a suitable depth. Anything inserted into a well has the potential to contaminate ground water by iron and sulfur bacteria. Disinfection of well equipment with chlorine can reduce this potential. Iron and sulfur bacteria cause a disagreeable taste and odor. Coliform bacteria can be detected only with a multiple-tube fermentation (MPN) or membranous filter test. These tests should be performed by trained technicians using proper techniques and sterile test equipment in a state-licensed lab. Iron and sulfur bacteria are readily removed by proper chlorination. Fecal contamination is more difficult to remove. First the source of contamination must be located and eliminated. The aquifer may be decontaminated with short-term superchlorination followed by development. However, if the aquifer is extensively polluted, the water supply should be treated or a new aquifer located. (Purdin-NWWA)
W80-05064

WATER DISTRICT'S NEEDS ARE MET,
UOP, Inc., St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 4B.
W80-05082

WELL MAINTENANCE PROGRAMS CAN PREVENT FAILURES,
UOP, Inc., St. Paul, MN. Johnson Div.
R. L. Moore.
The Johnson Drillers Journal, Vol 52, No 1, p 4-7, January-February, 1980.

Descriptors: *Water wells, *Failure(Mechanics), *Maintenance, Sand pumping, Corrosion, Scaling, Pumps, Chemical degradation, Electrolysis, Well casings, Well screens, Collapse, Clogging, Inspection, Monitoring.

The deterioration of a well is usually gradual and predictable. A well may fail through sand pumping, corrosion, incrustation or by a breakdown in the pumping equipment. Sand pumping can occur in semi-consolidated or unconsolidated formations and is usually the result of poor screen design in new wells or corrosion in older wells. Corrosion can be due to chemical action or electrochemical action. Besides sand pumping, corrosion causes loss of strength and resulting collapse, and redeposition of corrosion products resulting in reduced yield. Chemical corrosion is found in low pH, low TDS environments, while in high pH, high TDS environments electrochemical corrosion occurs along with incrustation. Incrustation also occurs due to sharp pressure reductions near the screen causing precipitation of calcium carbonate or iron compounds. Deterioration of the well or pump can be detected early by periodic inspection and monitoring. Once the problem is identified, a regular program of preventive maintenance will insure a constant, reliable source of water for many years. (Purdin-NWWA)
W80-05084

8B. Hydraulics

FORCE FLUCTUATIONS ON SILL OF HYDRAULIC JUMP,
University of Manchester Inst. of Science and Technology (England). Dept. of Civil and Structural Engineering.
R. Narayanan, and L. S. Schizas.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 106, No HY4, Proceedings Paper 15368, p 589-599, April 1980. 20 Fig, 9 Ref, 2 Append.

Descriptors: *Hydraulics, *Loads(Forces), *Energy dissipation, *Hydraulic jump, Flow, Fluctuations, Baffles, Energy, Turbulence, Drag, Model studies, Hydraulic models, Measurements, Instrumentation, Analysis, Data collections, Laboratory tests, Dimensional analysis, Hydraulic structures, Sills.

Fluctuations of force exerted on the sill of a forced hydraulic jump were measured and presented in terms of their root-mean-square values. Experiments involved a wide range of flow conditions, various distances of the sill from the efflux, and four different heights of the sill. Maximum intensity of force fluctuations occurs when the toe of the jump begins to be sensitive to the depth downstream of the sill. Under those conditions, the spectra of fluctuations exhibit a dominant frequency. At high submergence the intensity depends essentially on the height of the sill. (Humphreys-ISWS)
W80-04834

EXPERIMENTAL DETERMINATION OF THE VELOCITY GRADIENT IN TWO DIMENSIONAL TURBULENT FLOW,
Vanderbilt Univ., Nashville, TN.
S. D. Harris, J. W. Williamson, and R. H. French.
Journal of Hydraulic Research, Vol 18, No 1, p 25-33, 1980. 4 Fig, 3 Ref.

Descriptors: *Turbulent flow, *Flow characteristics, *Instrumentation, Velocity, Laboratory tests, Design, Turbulence, Measurement, Analytical techniques, Current meters, Hydraulics, Calibrations, *Velocity gradients, Velocity profiles.

Most experimental values of the velocity gradient, du/dy, in turbulent flow have been determined indirectly by first obtaining an experimental velocity profile and then graphically differentiating this profile. Thus, du/dy reflects errors made in measuring the velocity profile and errors made in obtaining the derivative of this profile by graphical techniques. Hence, the accuracy of du/dy and the subsequent mixing lenght and transfer coefficient calculations could be improved if an experimental method of obtaining du/dy directly in fully-developed, two-dimensional, turbulent boundary layer flow were available. The design of the gradient transducer involved the careful consideration of how airfoils generate lift. After testing several possible shapes, a satisfactory airfoil was devised. This airfoil was 3.81 cm.(1.5 in.) long and had a chord length of 1.905 cm.(0.75 in.). Its leading edge was rounded and its maximum thickness was 0.13 cm.(0.05 in.). The thickness decreased uniformly to a sharp, trailing edge. The lift force exerted on this airfoil was in the expected direction. The device was calibrated in a rectangular duct, and the results clearly demonstrate the validity of the design and the feasibility of measuring du/dy directly and accurately. (Humphreys-ISWS)
W80-04836

OSCILLATOR-MODEL APPROACH TO THE IDENTIFICATION AND ASSESSMENT OF FLOW-INDUCED VIBRATIONS IN A SYSTEM,
Karlsruhe Univ. (Germany, F.R.). Inst. fuer Hydromechanik.
E. Naudascher, and D. Rockwell.
Journal of Hydraulic Research, Vol 18, No 1, p 59-82, 1980. 12 Fig, 12 Ref.

Descriptors: *Hydrodynamics, *Flow around objects, *Vibrations, *Flow control, *Reviews, Flow system, Hydraulic structures, Flow characteristics, Mathematical models, Analytical techniques, Analysis, Dynamics, Drag, Frequency stabilizers, Flow system, Resonance, Sluice gates, Vortices, Surges, Standing waves, Flow-induced vibrations, Flow instability, Oscillations, Cylinders.

A scheme was presented for classifying problems of flow-induced vibrations according to basic types of excitation (extraneously, instability-, and movement-induced excitation) and basic flow modules. It was shown that vibrations in a complex system can be treated by a lumped-parameter approach using oscillator equations for the structures or structural parts, the unstable flows, and the possible fluid oscillators (surges or standing waves) within the system. A valve-conduit-surge-tank system was used to exemplify that this approach can be applied to assess dangerous spots and operating conditions in a system, to formulate vibration-prevention measures, and to analyze the first-order system behavior. The drawbacks of the current oscillator models are mainly due to their heuristic derivation and the necessary trial-and-error adjustments to available experimental evidence. An important task for future research would be to attempt a derivation of the flow- and fluid-oscillator models as a function of clearly identifiable flow processes and flow/structure interactions. (Humphreys-ISWS)
W80-04838

A NEW MEASURING DEVICE FOR QUICKLY VARYING LIQUID LEVELS (PRINCIPE D'UN NOUVEAU DISPOSITIF DE MESURE DES NIVEAUX DE LIQUIDES),
Centre National de la Recherche Scientifique, Toulouse (France). Inst. de Mecanique des Fluides.
For primary bibliographic entry see Field 7B.
W80-04839

TRANSPORT PROCESSES OF PARTICLES IN NON-DILUTE SUSPENSIONS IN TURBULENT WATER FLOW- PHASE I: EXPERIMENTAL MEASUREMENTS,
Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering.

B. G. Jones, and J. E. Gronager.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-180946, Price codes: A09 in paper copy, A01 in microfiche. Water Resources Center, University of Illinois Research Report No 148, March 1980. 189 p, 76 Fig, 10 Tab, 37 Ref. OWRT A-085-ILL(1), 14-34-0001-8015.

Descriptors: *Turbulent transport, *Dispersion, *Sedimentation, *Slurry, *Particle suspension, Turbulent flow, Particle shape, Particle size, Particle transport, Model studies, Suspended solids.

Increased utilization of non-dilute, solid-fluid suspensions in transporting materials and in estimating the distribution of particles from atmospheric fallout, demands that the basic fluid-particle interactions be thoroughly understood. Our previous studies of such interactions were conducted only on dilute suspensions, where as this study has been conducted in the same vertical flows but with solid spherical particle suspensions with concentrations, phi, from 0 to 10 percent by volume, a range of practical interest to sedimentation and erosion as well as in slurry pipelines. Detailed experimental results of the particle-fluid relative mean and rms velocities as well as particle dispersion were obtained for two particle densities and several phi values. Both particle types showed a rapid rise of both relative mean and rms velocities as phi increased to about 1-2 percent and fell off gradually for higher phi values. Dispersion followed a similar behavior. The higher free fall velocity particles exhibited larger rms velocities and increased dispersion from the lighter, lower free fall velocity particles. Analytical models of the phi-dependence showed good agreement with the data, suggesting their use in engineering predictions.
W80-04866

SURCHARGE OF SEWER SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. C. Yen, and N. Pansic.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-181233, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center, University of Illinois Research Report No 149, March 1980. 66 p, 20 Fig, 7 Tab, 55 Ref. OWRT A-086-ILL(2), 14-31-0001-8015.

Descriptors: *Drainage systems, *Sewers, *Storm drains, *Unsteady flow, Computer models, Pipe flow, Conduit flow, Flood routing, Hydraulics, Hydrographs, Mathematical models, Open-channel flow, Sewer systems, Storm runoff, Urban drainage, Urban runoff.

Surcharge of a sewer is the situation in which the sewer entrance and exittare submerged and the pipe is flowing full and under pressure. In this report the hydraulics of the surcharged flow as well as the open-channel flow leading to and after surcharge is discussed in detail and formulated mathematically. The transition between open-channel and surcharge flows is also discussed. This information is especially useful for those who intend to make accurate advanced simulation of sewer flows. In this study an approximate kinematic wave - surcharge model called SURKNET is formulated to simulate open-channel and surcharge flow of storm runoff in a sewer system. An example application of the model on a hypothetical sewer system is presented.
W80-04867

AQUIFERS STORE ENERGY.
For primary bibliographic entry see Field 3C.
W80-04940

DEEP EXCAVATION IN PUERTO RICO IS DEWATERED,
Paniagua, Rodriguez, Garcia and Crumley, San Juan, PR.
A. R. Crumley.
The Johnson Driller's Journal, Vol 51, No 6, p 4-6, November-December, 1979. 3 Fig.

Descriptors: *Dewatering, *Excavation, *Well points, *Puerto Rico, Water wells, Water table, Artesian aquifers, Drainage, Permeability, Aquifer testing.

Seven, deep, high-capacity wells were used to dewater an excavation 43 feet below the ground water table. In-situ testing of site permeability revealed variations by several orders of magnitude. This necessitated full-scale pumping tests lasting for seven days. These tests indicated that certain sections of the aquifer were under artesian conditions. Thus, during excavation pockets of trapped water were encountered. The number of wells and the pumping rate from each were carefully adjusted to attain optimum performance. Seven, 80-feet-deep, 12-inch-diameter wells were installed, each pumping 1200 gpm. Wire-wound stainless steel screens were used due to high flow rates and the possibility of corrosion and incrustation. Seven diesel pumps were maintained daily to ensure that at least six were always in operation. Final flows with the excavation fully dewatered were 800 gpm per well. (Purdin-NWWA)
W80-04944

FLOW NETS BY THE FINITE ELEMENT METHOD,
Stone and Webster Engineering Corp., Boston, MA.
For primary bibliographic entry see Field 7C.
W80-05058

8C. Hydraulic Machinery

EARLY PRESSURE SYSTEMS: THE WATER RAM,
Ridgetown Coll. of Agricultural Tech. (Ontario).
C. S. Baldwin.
Canadian Water Well, Vol 6, No 1, p 25, February, 1980. 1 Fig.

Descriptors: *Hydraulic ram, *Pumps, Water storage, Costs, Maintenance.

The water ram is a device for pumping water by means of waterpower connected with a spring, pond or creek with a minimum flow of 1 1/2 gallons per minute and a minimum fall of 18 inches. The ram can pump to a height of 25 feet for every foot of fall in the stream. Since the moving parts are minimal, the ram has low initial cost and runs for years without maintenance. Most of the cost is in the piping from the ram to a storage tank. (Purdin-NWWA)
W80-04952

SUBMERSIBLE PUMPS--FIELD SERVICE,
K. George.
Canadian Water Well, Vol 6, No 1, p 22-24, February, 1980. 5 Fig, 1 Tab.

Descriptors: *Submersible pumps, *Servicing, *Maintenance, Failure(Mechanics), Electric power failure, *Pumps, Electrical equipment, Water wells.

Submersible pumps have greater reliability and efficiency, are easier to install, and cost less than jet pumps and line shaft driven pumps. Most submersibles require little or no periodic maintenance. However, when service is required, a systematic above-ground checking procedure should be followed to avoid the cost of unnecessarily pulling the pump. Checking procedures are listed for the most frequent problems. Repeated failures of pump, cable or motor indicate installation problems which should be corrected. These common causes for failure are listed. Proper well construction and installation plus a well-designed submersible pumping system are necessary to ensure a reliable and lasting water supply. (Purdin-NWWA)
W80-04953

DESIGN OF A COST EFFECTIVE SOLAR POWERED WATER PUMP,
Utah Water Research Lab., Logan.
D. G. Chadwick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182819, Price codes: A03 in paper copy, A01 in microfiche. Hydraulics and Hydrology Series UWRL/H-80/02, April 1980. 36 p, 33 Fig, 2 Tab, 2 Append. OWRT-A-036-UTAH(1), 14-34-0001-8047.

Descriptors: *Solar radiation, *Pumps, *Cost-benefit analysis, *Design criteria, Solar power, Water pumps, Technology, Testing.

The design and performance of a vacuum lift, solar powered water pump is discussed. The basic design consists of an expanding gaseous piston confined inside a chamber which is located in series with, and between, an inlet and an outlet check valve. The gas is generated by volatilizing cyclopentane or hexane. Four variations of this basic design concept were built and evaluated. The various features of each are discussed. Considerations in the choice of a cost-effective solar collector are also reviewed. Several of the more promising types of solar collectors were built and evaluated for use on the pump. A 70C heat source temperature is required to operate the pump if cyclopentane is used as the volatile fluid, 90C is required if hexane is used. The volatile fluid is not expended in the pumping process. The pumps constructed on this project have a capacity of approximately 6 liters/minute when pumped to a height of 2 meters. Two square meters of sunshine are sufficient to operate the pump.
W80-05011

A TECHNICAL EXAMINATION OF GROUND WATER GEOTHERMAL HEAT PUMP COMPONENTS,
Friedrich Air Conditioning and Refrigeration Co., Fort Lauderdale, FL.
W. M. Hughes.
Ground Water Heat Pump Journal, Vol 1, No 1, p 14-15, Spring, 1980. 2 Fig.

Descriptors: *Heat pump, *Design, *Equipment, Temperature control, Heating, Cooling, Coolants, Condenser, Evaporators, Valves, Ducts, Heat exchangers, Ground water.

The heat pump cycle allows the same ground water to be used as either a sink or a source depending on whether heating or cooling is required in the space. The reason that this can be done is that the heat is transferred into and out of a refrigerant (commonly Freon). A heat pump functions by first evaporating the Freon at low temperature (and pressure) in an evaporator where air is cooled. A compressor then compresses the cold vapor into a hot, high-pressure vapor. This hot vapor condenses into a warm liquid in a condenser. The heat that is released by the Freon goes into the water. The liquid Freon goes through an expansion device causing a drop in pressure and a corresponding temperature drop. Most heat pumps contain a reversing valve which changes the routing of the Freon inside the unit so that either heating or cooling can be produced. A blower draws the return air through a filter and over the coil and discharges the cooled or heated air into the ductwork where it is distributed throughout the building. Optional heat pump components include an auxiliary electric resistance heating unit for supplementary or backup heat and a desuperheater water heater. (Purdin-NWWA)
W80-05051

WELL MAINTENANCE PROGRAMS CAN PREVENT FAILURES,
UOP, Inc., St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 8A.
W80-05084

8G. Materials

USING NONMETALLIC CASING FOR GEOTHERMAL WELLS,
National Water Well Association, Worthington, OH.
W. H. Purdin.
Water Well Journal, Vol 34, No 4, p 90-91, April,

1980. 1 Tab.

Descriptors: *Well casings, *Plastic pipe, *Geothermal studies, *Drilling, Wells, Physical properties, Thermal properties, Chemical properties, Cost comparisons, Corrosion control, Rotary drilling, Collapse, Safety.

Various nonmetallic well casings can be used to help reduce the cost of installation maintenance and replacement of geothermal wells. The physical, thermal, and chemical properties and costs of these casings are compared. Thermoplastic casings cost less and have greater chemical resistance but less thermal resistance and structural strength than thermosetting plastic casings. Of the 'nonplastic' casings, polymer concrete has the best rating. The many advantages of these materials far outweigh their disadvantages. Because of their light weight, drilling cost is reduced. In some cases, the cost of the casing may be less than half as much as steel casing. Drilling geothermal wells and installing nonmetallic casing requires special precautions. Cable tool rigs should not be used with nonmetallic casing since it can't be driven. Casing can collapse due to bridging and subsequent collapse of the gravel pack, heat of hydration during grouting, or surging during development. Also, it may perform well for several years but suddenly collapse due to ground subsidence or high formation temperatures. Several steps are outlined to avoid collapse. (Purdin-NWWA)
W80-05063

8I. Fisheries Engineering

AQUATIC STUDIES OF THE YELLOWSTONE RIVER,
Montana Fish and Game Dept., Helena. Environment and Information Div.
P. J. Graham, R. F. Penkal, and L. Peterman.
Report No REC-ERC-79-8, July 1979. 88 p, 60 Fig, 12 Tab, 39 Ref, 2 Append.

Descriptors: *Fish migration, *Sauger, *Walleye, *Diversion structures, Spawning, Fish barriers, Fish behavior, Fish populations, Fish passages, Fish reproduction, Electro-fishing, Turbulence, Streamflow, Regulated flow, Yellowstone River(Mont), Montana.

The effects of streamflow alterations on sauger and walleye populations in the lower Yellowstone River were studied. These fish were selected for the study due to their movement related to spawning, feeding, over-wintering, and other biological activities. The lower half of the river from the mouth of the Big Horn River downstream to the North Dakota border was the area investigated. There are two major diversions along this reach, the Forsyth diversion, a concrete structure across the entire river that creates a 0.5-m vertical drop, and the Intake diversion, a wooden structure covered by boulders extending across the main channel creating a turbulent 1.2-m drop in 30-m. Both structures divert water for irrigation. Fish samples were taken both upstream and downstream from each diversion. Fish were collected by boom electrofishing from a flatbottomed aluminum boat. Fish length, mass, and sex were determined and the fish were tagged and released near the middle of each section. Fish tag return data were collected and grouped by fish recapture time. Results show that walleye migrated upstream to the Intake diversion, spawned, and went back downstream. Sauger similarity concentrated below each diversion but their migration over the Intake diversion was extensive. Few sauger and no walleye migrated over the 0.5-m vertical drop of the Forsyth diversion. Fish were progressively more abundant in downstream sections. Egg abundances were also studied. (Seigler-IPA)
W80-04880

THE LAW OF THE SEA AND REGIONAL FISHERIES POLICY,
South Pacific Commission, Noumea (New Caledonia).
For primary bibliographic entry see Field 6E.
W80-04971

9. MANPOWER, GRANTS AND FACILITIES

9B. Education (In-House)

IDENTIFYING AND MEETING TRAINING NEEDS FOR PUBLIC PARTICIPATION RESPONSIBILITIES IN WATER RESOURCES PLANNING,
Massachusetts Univ., Amherst. Water Resources Research Center.
M. O. Ertel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-182827, Price codes: A03 in paper copy, A01 in microfiche. Publication No 107, 1979. 32 p, 4 Tab, 25 Ref, 2 Append. OWRT B-063-MASS(1), 14-34-001-8090.

Descriptors: *Public participation, *Social participation, *Training, *Water resources development, Planning, Comprehensive planning, Social aspects, Political aspects, Universities.

Legislative mandates are increasingly assigning to water resources planning agencies the responsibility for conducting public participation programs. Few planning programs, however, have the resources to employ professionals with specialized training in the types of skills that are crucial to successful public participation programming, and planners themselves are often required to perform this function in addition to other duties. This project has documented the extent of this situation through a survey of planners in Coastal Zone Management and '208' programs in New England. The survey also determined these practitioners' educational and experiential preparation for performing public participation functions, as well as their own perceptions of the relative importance of those functions and the adequacy with which they were carried out. The research indicates that prior experience is more directly related to perceived adequacy than either academic or experiential background and therefore concludes that all planners should receive, as part of their professional preparation, specific training that will give them a viable substitute for this experience before they begin their professional careers. Recommendations for such a curriculum, stressing the importance of the development of public communications skills, are provided. (Godfrey-Mass)
W80-05015

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

NOTES ON SEDIMENTATION ACTIVITIES CALENDAR YEAR 1978.
Geological Survey, Reston, VA.
January 1980. 244 p.

Descriptors: *Sedimentation, *Data collections, *Water Resources Development, *Federal government, Tennessee Valley Authority, Engineering, Research and Development, Publications, Water resources, Sediment control, Sediment transport, Dredging, Desilting.

Information in the field of sedimentation on: the activities of Federal agencies, work in progress or planned, important findings, new methods, new publications, laboratory and other research activities, and other pertinent data are reported for 1978. The report is organized by 21 major drainage areas in the conterminous United States, Alaska, Hawaii, Puerto Rico, and some foreign areas. Departments and agencies involved in sedimentation activities include: in the Department of Agriculture, the Forest Service, the Science and Education Administration, and the Soil Conservation Service; in the Department of the Army, the Corps of Engineers; in the Department of Commerce, the National Oceanic and Atmospheric Administration; in the Department of Energy, the Federal Energy Regulatory Commission; in the Department of the Interior, the Bureau of Mines, the Bureau of Reclamation, and the Geological Survey; in the Department of Transportation, the Federal Highway Administration; and the Tennessee Valley Authority. Not all agencies are active in all regions. A map illustrating the water resources regions of the United States is included. (Seigler-IPA)
W80-04882

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